1345

THE

JOURNAL

OF

GAS LIGHTING,

WATER SUPPLY,

Etc.

VOL. LXXXIX.

JANUARY TO MARCH, 1905.

LONDON:

WALTER KING,

11, BOLT COURT, FLEET STREET, E.C.

THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LXXXIX. No. 2173.] LONDON, JANUARY 3, 1905. [57TH YEAR. PRICE 6d.

PARKER & LESTER,

— *ESTABLISHED 1830.* —

MANUFACTURERS AND CONTRACTORS. **ORMSIDE STREET, LONDON, S.E.**

THE ONLY MAKERS OF

PATENT ANTIMONY PAINT & PARKER'S IMPERIAL BLACK VARNISH.

OXIDE PAINTS, OILS, AND GENERAL STORES, FOR GAS AND WATER WORKS.

SAFETY GAS-MAIN STOPPER,

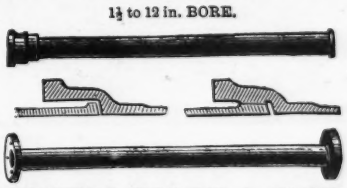
FOR SHUTTING OFF GAS IN MAINS TEMPORARILY DURING ALTERATIONS AND REPAIRS.

GAS-LEAK INDICATOR.

PRICES AND PARTICULARS ON APPLICATION

GAS AND WATER PIPES

1¼ to 12 in. BORE.



THOMAS ALLAN & SONS, LIMITED,

Bonlea Foundry,

THORNABY-ON-TEES.

Formerly Springbank Iron-Works, Glasgow.

ESTABLISHED 1848.

Also Manufacturers of

SANITARY AND RAIN-WATER PIPES, HOT WATER PIPES, STABLE FITTINGS, RANGES, STOVES, AND GENERAL CASTINGS.

Telegrams: "BONLEA, THORNABY-ON-TEES."

NORTON'S PATENT

"ABYSSINIAN" & ARTESIAN TUBE WELLS,

FOR TOWN WATER-WORKS AND OTHER SUPPLIES.

The following Town Water-Works Supplies have been obtained by this System, viz.:—Abbott's Langley, Aldershot, Alnwick, Cirencester, Hertford, Lechlade, St. Albans, Shrewsbury, Skegness, Southampton, Stony Stratford, Swansea, Wallingford, Watford, West Worthing, Wimborne, &c.

LE GRAND & SUTCLIFF,

HYDRAULIC ENGINEERS, 100, BUNHILL ROW, LONDON, E.C.

13,000

FURNACES

FITTED.

CHEAP STEAM PRODUCTION.

TO THE EDITOR OF ENGINEERING.

SIR,—Some years ago we attached forced draught and special fire-bars to our two Lancashire boilers, with the object of burning coke dust. The load has grown, and last week I had the water and fuel carefully checked, with the following results:—

Water used in boilers from Dec. 9 to Dec. 16, as per Corporation meter .	79,300		
Fuel used from Dec. 9 to Dec. 16: Coke	£	s.	d.
dust—41 tons 4 cwt., at 1s. 11d. .	3	19	0
Washed slack—15 tons 17 cwt., at 6s. 6d.	5	3	2
	£9	2	2

This works out at a fraction under 2s. 4d. per 1000 gallons. Can this result be beaten? I may add that the water-feed to the boilers is heated by the exhaust steam from the engines to 200 deg.

Yours truly,
C. D. LENG.

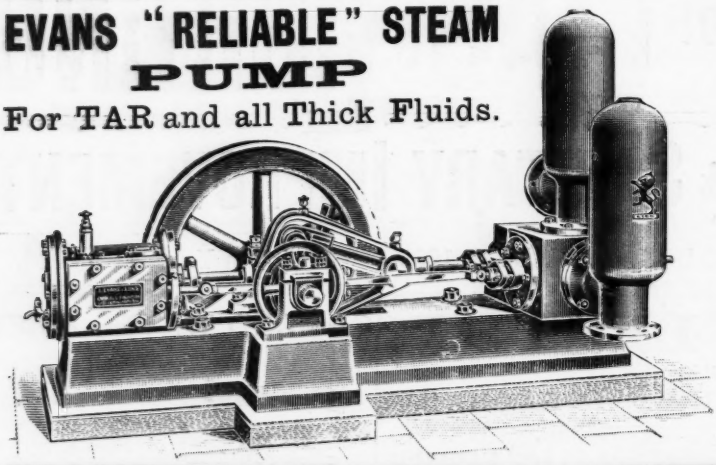
High Street, Sheffield, Dec. 19, 1904.

FOR FURTHER PARTICULARS APPLY—

MELDRUM BROS., LTD., TIMPERLEY, MANCHESTER; AND 66, VICTORIA STREET, WESTMINSTER.

EVANS "RELIABLE" STEAM PUMP

For TAR and all Thick Fluids.



FIRST AWARDS EVERYWHERE.

Write for No. 8 Catalogue.

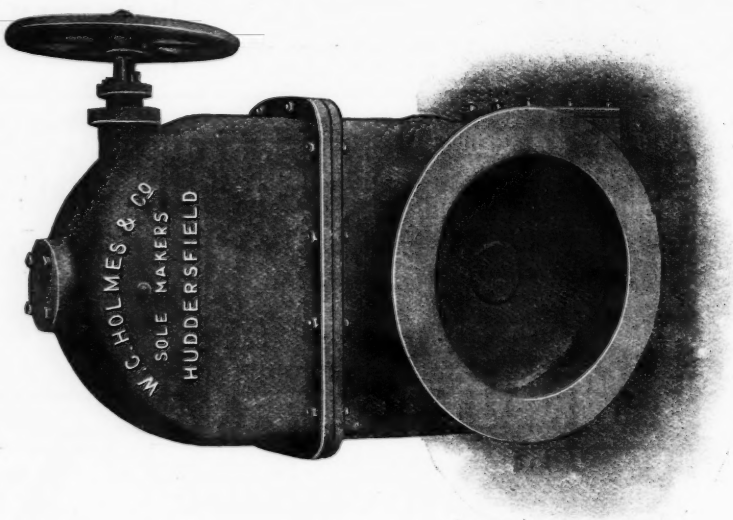
Telegrams:
"EVANS, WOLVERHAMPTON."
National Telephone No. 39.
London Office,
SALISBURY HOUSE, LONDON WALL, E.C.

JOSEPH EVANS & SONS,
CULWELL WORKS,
WOLVERHAMPTON.

DOUBLE FACED VALVES

"WESTERN" TYPE,

MADE IN HORIZONTAL OR VERTICAL FORM from 3 in. to 48 in.



W. C. HOLMES & Co., HUDDERSFIELD.

HIGHEST AWARDS—LONDON, PARIS, COLOGNE, VIENNA, MELBOURNE, AND OTHERS.

—11 MEDALS.—

MANUFACTURERS OF TUBES AND FITTINGS OF EVERY DESCRIPTION.

WROUGHT-IRON OR STEEL MAINS UP TO 6 FEET DIAMETER FOR GAS, WATER, OIL, OR OTHER PURPOSES.

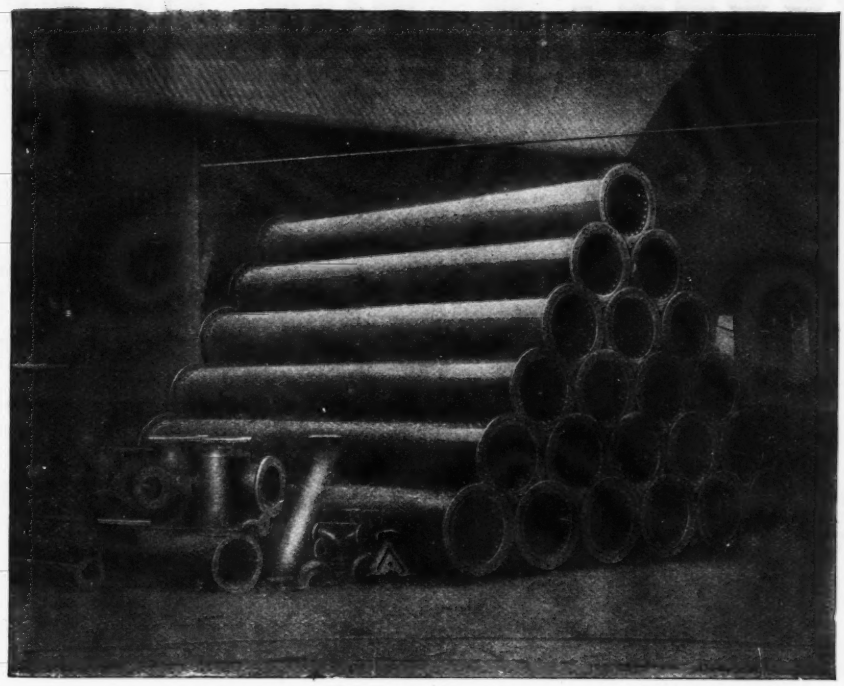
SCREWING TACKLE, BOILER MOUNTINGS, VALVES, COCKS, ETC.

LONDON: 102, Southwark Street.
MANCHESTER: 33, King Street West.
BIRMINGHAM: 114, Colmore Row.
LEEDS: 6, Mark Lane, New Briggate.

THOMAS PIGGOTT & CO., LTD., BIRMINGHAM.

London Office:
63, QUEEN VICTORIA ST., E.C.

Gas Plants, Roofs, Retort-Fittings, Etc.



Telegraphic Address:
"ATLAS BIRMINGHAM."

Welded and Riveted Pipes, Foul Mains, Retort-Lids, Wrot. and Cast Tanks, Purifiers.

STEEL PIPES OF ALL SIZES AND DESCRIPTION.

MANUFACTURERS OF

HUMPHREYS & GLASGOW'S CARBURETTED WATER-GAS PLANT.

INSTALLATIONS HAVE ALREADY BEEN ADOPTED WITH AN AGGREGATE CAPACITY OF 152,300,000 CUB. FT. DAILY.

HARRIS & PEARSON,

STOURBRIDGE, ENGLAND,

MANUFACTURERS OF

FIRE-CLAY GAS-RETORTS, FIRE-BRICKS, LUMPS, & TILES of Every Description.

GLAZED BRICKS AND PORCELAIN BATHS.

THE SILICA FIRE-BRICK COMPANY,

OUGHTIBRIDGE, NEAR SHEFFIELD.

Established 1858. The First Manufactory of Silica and Dinas Fire-Bricks erected in England.

MANUFACTURERS OF

SILICA FIRE-BRICKS

TRADE MARK "SILICA."

Our Silica Bricks have gained a high reputation for Unsurpassed Quality in most of the leading Firms in England and on the Continent. Export orders delivered Liverpool, Hull, Grimsby, or the Tyne.

HISLOP'S PATENT RETORT SETTINGS.

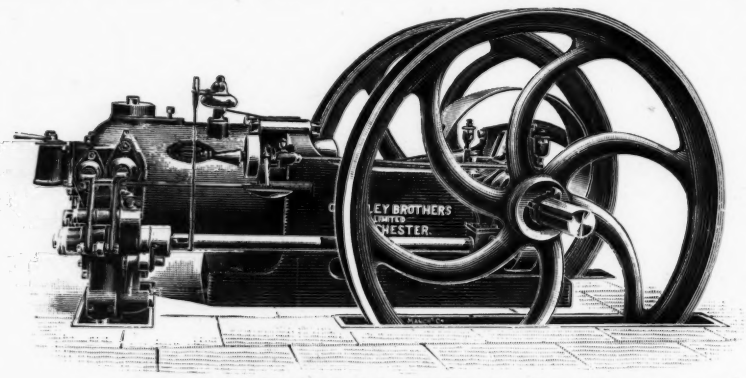
The very best to adopt for Productive Capacity, Economy of Fuel, Durability, and Simplicity of Management.

R. & G. HISLOP, Gas Engineers and Contractors, PAISLEY, N.B.

LONDON: 11, QUEEN VICTORIA STREET, E.C.

CROSSLEY'S GAS-ENGINES

SUITABLE FOR DRIVING EXHAUSTERS, PUMPS, &c.



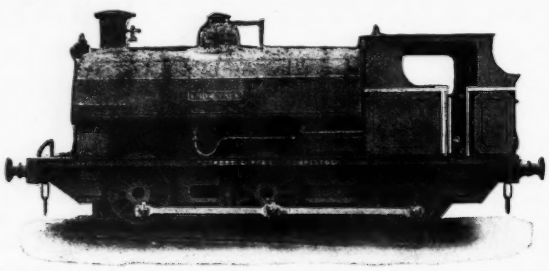
Represents "XA" Type giving 60 Effective Horse Power.

ENGINES DELIVERED—Up to the end of 1903, 48,839 Engines have been delivered representing 701,700 B. H.P.

IMMEDIATE DELIVERY FOR STOCK SIZES OF ENGINES.

Large Number of Second-Hand Engines always in Stock.

CROSSLEY BROS., LTD., OPENSHAW, MANCHESTER.



LOCOMOTIVES

LOCOMOTIVES of all Sizes and Gauges specially constructed for Main and Branch Lines, Contractors, Docks, Gas-Works, Collieries, Iron-Works, Brick and Cement Works, &c. Locomotives of various Sizes always in Stock, ready for immediate Delivery.

Photographs, Specifications, and Prices on Application.

PECKETT & SONS, Atlas Locomotive Works, BRISTOL.

Telegraphic Address: "PECKETT, BRISTOL."

NEWTON, CHAMBERS, & CO.,

LIMITED.

THORNCLIFFE IRON-WORKS, near SHEFFIELD.

Established 1790

LONDON OFFICE: **19, Great George Street, WESTMINSTER.**

Telegraphic Addresses, "NEWTON, SHEFFIELD," "ACCOLADE, LONDON."

GAS ENGINEERS, IRONFOUNDERS, and CONTRACTORS.

MANUFACTURERS OF EVERY DESCRIPTION OF

PLANT, APPARATUS, AND MACHINERY FOR GAS AND CHEMICAL WORKS.
RETORTS AND FITTINGS, MOUTHPIECES WITH SELF-SEALING LIDS.
IMPROVED COAL AND COKE HANDLING PLANT, CONVEYORS, AND ELEVATORS.
CONDENSERS, SCRUBBERS, AND WASHERS.

PURIFIERS with Planed Joints a Speciality.

PATENT CENTRE-VALVES, RACK AND SCREW VALVES, WOOD GRIDS AND SCRUBBER-BOARDS, CAST-IRON MAINS, AND SPECIALS.
STRUCTURAL WORK, COLUMNS, GIRDERS, AND ROOFING.
GASHOLDERS, CAST-IRON OR STEEL TANKS.

DESIGNS, SPECIFICATIONS, and ESTIMATES FREE.

PIG IRON (SPECIAL QUALITY) for Engine Cylinders. GAS COAL famous for its Unrivalled excellence.

WELSBACH MANTLES

Registered **A.U.R.** Trade Mark.

SWEEPING REDUCTIONS

On the 1st of JANUARY, 1905,

IN THE PRICES OF

WELSBACH "C" & PLAISSETTY MANTLES

TO THE GAS TRADE.

Welsbach Mantles are BRITISH MADE THROUGHOUT by British Labour, and carry the usual Warranty of replacement.

There are no Mantles so good as Welsbach.

WRITE FOR FULL PARTICULARS OF NEW PRICES.

THE

WELSBACH INCANDESCENT GASLIGHT CO., LIMITED,

2 to 14, Palmer Street, **WESTMINSTER, S.W.**

Telegrams: "WELSBACH, LONDON." *Telephone: 290 WEST.*

ALBION IRON WORKS,
MILES PLATTING,

MANCHESTER.

TELEGRAMS—
"STOKER, MANCHESTER."

WEST'S GAS IMPROVEMENT CO., LD.,

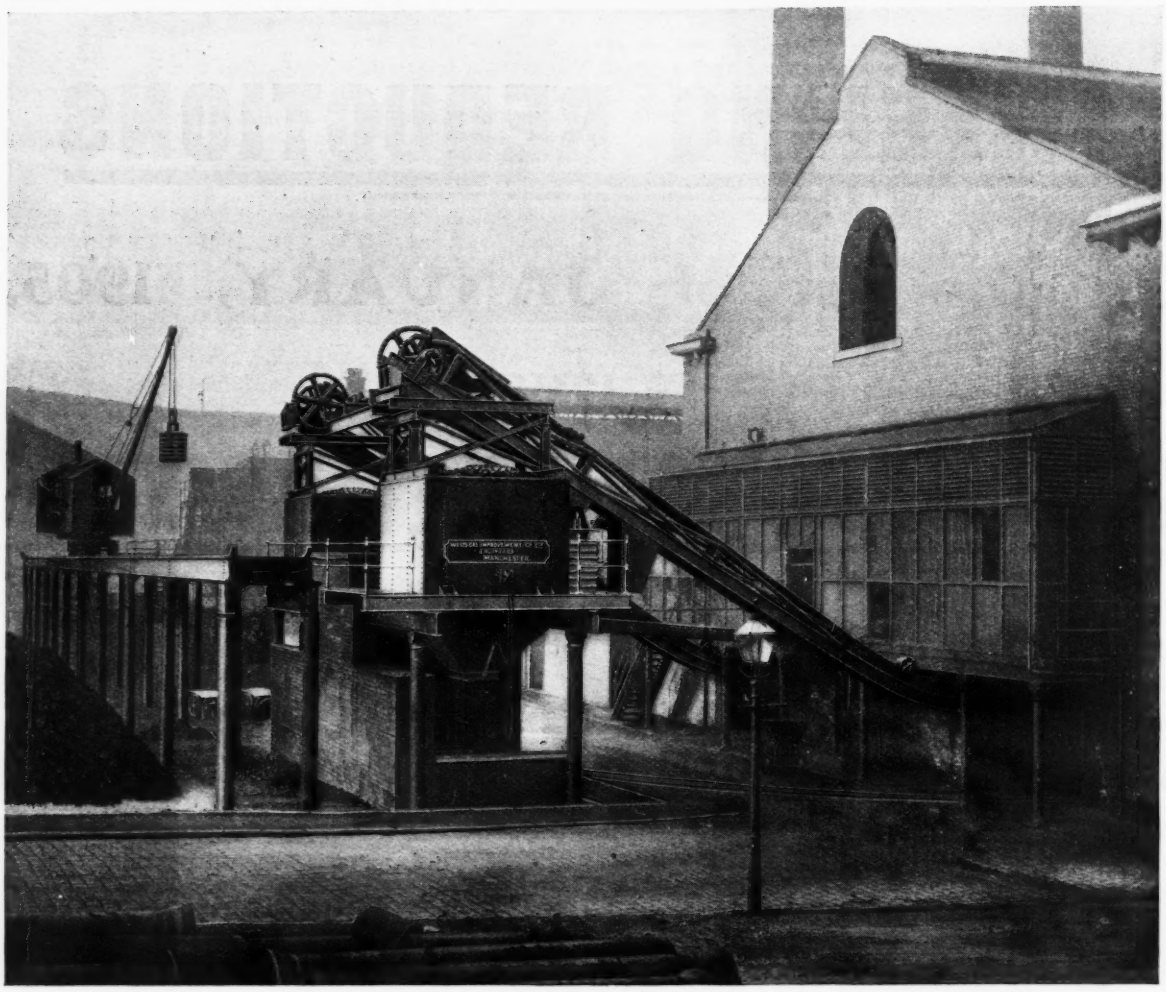
Gas and General Engineers.

CONTRACTORS FOR

COMPLETE RETORT-HOUSE PLANT

. . EITHER ON : . .

THE HORIZONTAL OR INCLINED SYSTEMS.



Photograph showing West's Coke-Conveyor dealing with the Coke from Nineteen Through Beds of Retorts.

WEST'S IMPROVED PATENT HOT-COKE CONVEYOR,

With Special Chain constructed with a minimum number of parts, and having Large Joint Pins with ample Bearing Surfaces.

WEST'S STOKING MACHINERY— COMPRESSED AIR DRIVEN AND MANUAL SYSTEMS.

COAL BREAKING, ELEVATING, & STORING PLANTS.

BELTON'S PATENT AUTOMATIC RELIEF APPARATUS FOR HYDRAULIC MAINS.

Manufacturers for America: Riter-Conley Manufacturing Company, Pittsburg.

TIMMIS'S PATENT

CLINKERING DOOR.

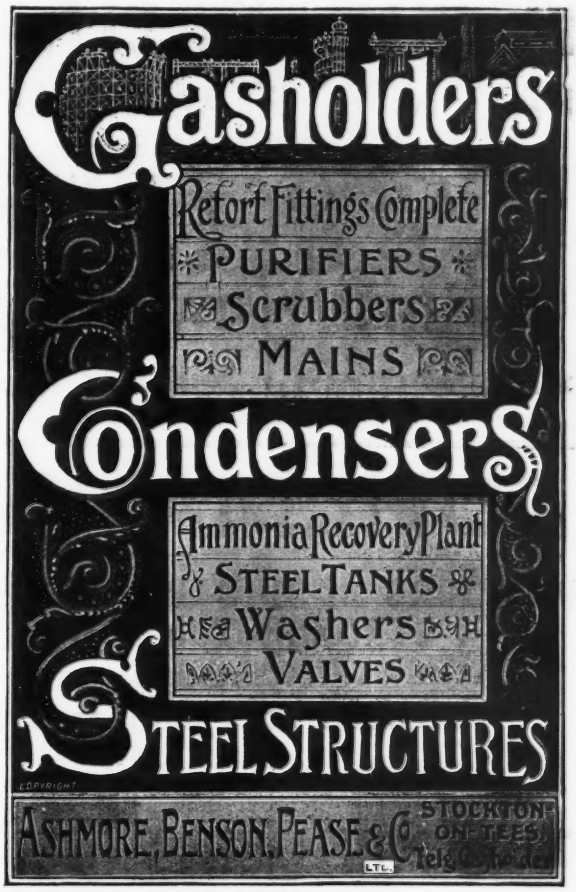
For Illustrated Advertisement, with full Particulars see "JOURNAL" for Dec. 13, p. 875.

GEO. H. TIMMIS,
River Stour Works, STOURBRIDGE.
Telegrams: "TIMMIS, LYE." National Telephone: 13, LYE.
or of **HARPER & MOORES, LTD.,**
STOURBRIDGE.

WE WANT TO MAKE
INCANDESCENT MANTLES
FOR YOU.

Before placing any Contracts it will pay you to consult us.

Dr. Alfred Oppenheim & Co.,
General Incandescent Mantle Works,
KREUTZBERGSTR. 36-38, BERLIN, S.W., GERMANY.
Sole Agent for the United Kingdom :
BRUNO SCHOMANN,
23, CHARTERHOUSE BUILDINGS, ALDERSGATE ST., E.C.



The "BRAY" Incandescent Gas
BURNERS AND MANTLES.

A BRILLIANT COMBINATION.

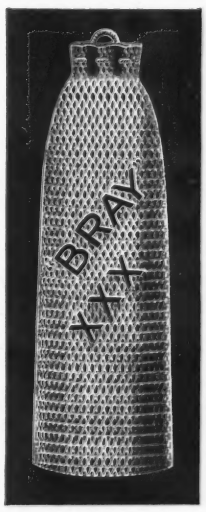
The "Bray" Burner gives a Maximum Light with a Minimum consumption of Gas.

PROFITABLE EVERY WAY.

The "BRAY" XXX Mantle

RAMIE FIBRE. DOUBLE WOVEN. EXTRA STRONG.

Send for Catalogue and Price List.



GEO. BRAY & CO., LTD., GAS LIGHTING ENGINEERS, **LEEDS.**

KIRKHAM, HULETT, & CHANDLER, LIMITED,

PATENT "STANDARD" WASHER-SCRUBBERS

(Improved Design with Isolated Bearings).

PATENT "STANDARD" CONDENSERS.

PATENT "STANDARD" TAR-WASHERS.

PATENT "STANDARD" PURIFYING GRIDS.

Palace Chambers, Bridge Street, Westminster, S.W.

Telegraphic Address: "WASHER, LONDON." Telephone No. 127 VICTORIA.

BUHLMANN MANTLES.

PIONEERS of CHEAP PRICES for BRITISH MANUFACTURE,
STRONGEST and BEST for STREET LIGHTING.

SPECIAL PRICES FOR

10 Gross Lots (delivered free).

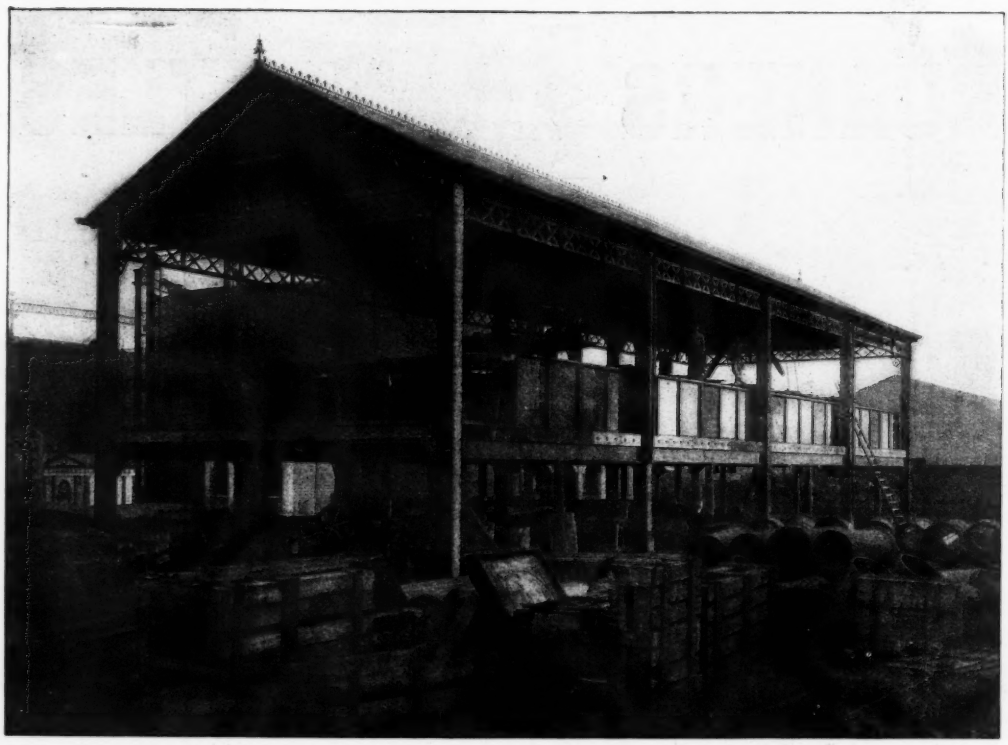
100 ,, ,, ,, ,, and other Concessions).

— PARTICULARS OF —

THE BUHLMANN INCANDESCENT SYNDICATE, LTD.,

WESTON ST., BROMLEY-BY-BOW, LONDON, E.

DRAKES LIMITED, HALIFAX.



WE RECENTLY ERECTED THESE 4 PURIFIERS 30 FEET SQUARE, WITH SUPERSTRUCTURE ROOF AND OXIDE ELEVATOR AND CONVEYOR.

"EUREKA"

Gas-Heated

STEAM RADIATORS

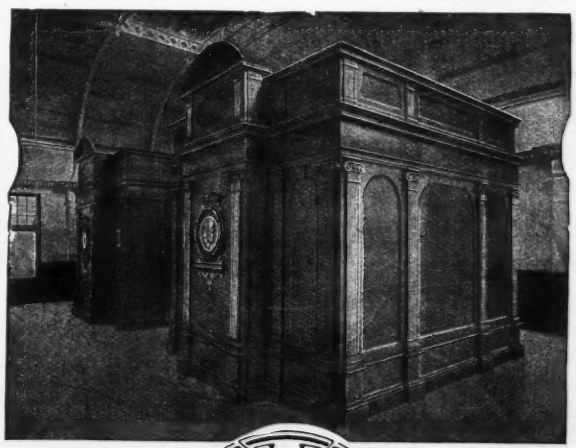
STEAM RADIATORS

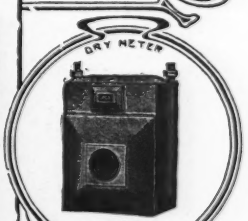
JOHN WRIGHT & CO., Essex Works, Aston, BIRMINGHAM.

R. LAIDLAW & SON,

LIMITED

GAS & WATER ENGINEERS,





SIMON SQUARE WORKS, EDINBURGH.

6 LITTLE BUSH LANE, LONDON, E.C.

TWO STATION METERS EACH TO PASS 200000 CUB. FT PER HOUR. ERECTED AT THE ALLIANCE FOUNDRY & ENGINEERING WORKS, GLASGOW.

GRANTON GAS WORKS FOR THE EDINBURGH & LEITH GAS COMMISSIONERS.

EXHAUSTING MACHINERY.

Oldest Makers of High-Class Exhausting Machinery of all Capacities and for all Purposes.

WALLER'S PATENT 3 AND 4 BLADE EXHAUSTERS

Require less Steam and maintain a steadier Gauge than any other type.

OVER 1000 SUPPLIED.

WALLER'S PATENT "COMBINED" EXHAUSTING SETS FOR SMALL WORKS.

With Steam or Gas Engine, and all Accessories self-contained on one base plate. From 500 cubic feet to 10,000 cubic feet per hour.

SPECIALLY DESIGNED EXHAUSTER SETS FOR WATER-GAS PLANTS.

EXHAUSTING MACHINERY FOR BYE-PRODUCT PLANTS.

COKE-BREAKING MACHINERY.

TAR, LIQUOR, AND WATER PUMPS.

GEORGE WALLER & SON,

165, QUEEN VICTORIA STREET, LONDON, E.C.

Works: Phœnix Iron-Works, Stroud, Gloucestershire.

Telegraphic Addresses { London: "Weighbeam, London." / Stroud: "Waller, Brimscombe." }

Telephone Numbers { London: 2420 (P.O.) Central. / Stroud: 210 Brimscombe. }

Agents for Scotland: D. M. NELSON & Co., 53. Waterloo Street, Glasgow.

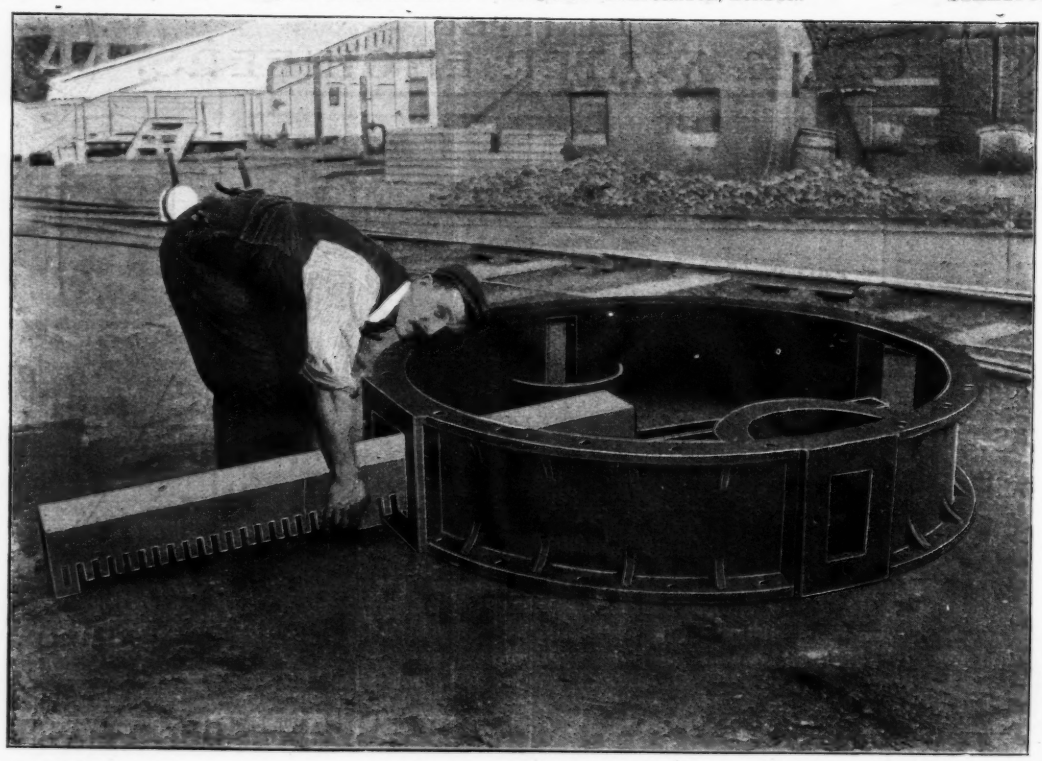
THE CHEMICAL ENGINEERING CO. & WILTON'S PATENT FURNACE CO.,

GEORGE WILTON, *Managing Director.* Late of THE GASLIGHT AND COKE Co.

79, MARK LANE, E.C.

elephone No. 2669 AVENUE. Telegrams: "EVAPORATOR, LONDON."

CROWN WORKS, ABBEY LANE, STRATFORD, E.



View of Wilton's Patent Ammoniacal Liquor Still showing removing of Bubbling Weir and accessible overflows. Easy to clean. Perfect in action. A 5 feet diameter still with 12 sections will produce 15 tons Sulphate of Ammonia per 24 hours. Test of Waste Liquor, ·01 per cent. NH_3.

CONTENTS.

EDITORIAL NOTES.

GAS, &c.—

Fog and Gas 13
Proposed Gas Legislation for the Metropolis 14
The Profession of Gas Engineering in America 15
Trade Unions and the Unemployed . . 16
Vertical Retorts and Naphthalene—The Passage of the Gas and the Effect—How the Commission System is Fostered—The Necessity of Discriminating — Mutual Workmen's Compensation Schemes—The Aggregate Results—Politics in Municipal Government 17

ESSAYS AND REVIEWS.

Electric Lighting Memoranda—Retrospect of the Past Year 19
Gas Stock and Share Market 20
Gas Bills for 1905 21
The Check to Trade Unionism 23
Public Lighting Squabble in New York . . 23
Naphthalene Freedom at Leicester . . . 24
The Fog and Large Gas Consumptions . . 24
The Principles of Local Government . . . 26
The Law Relating to Workmen's Compensation—Recommendations of the Departmental Committee 26

CORRESPONDENCE.

Impressions at the Gas Exhibition. . . . 42
Early History of Prepayment Gas-Meters . 42
The Proposed Gas Exhibition in Manchester 42
A Remedy for Naphthalene Troubles . . . 43

TECHNICAL RECORD.

The Latest German Form of Vertical Retort Setting 28
Bibbero's Incandescent Gas-Burner . . . 29
Redman's Patent Washer-Scrubber . . . 29
The Flow of Gas through Passages in Gas Apparatus, Openings in Plates, Valves, &c. By F. Southwell Cripps, Assoc.M.Inst.C.E. 30
British Association of Water-Works Engineers Mr. J. Hutton on Electrically Driven Pumping Plant for Water Supply, and Storage of Water under Pressure 32
Generation of Steam by Waste Heat from Water-Gas Plant 33
Distillation of Coal by Means of Highly-Heated Gas 35
Conway Corporation Gas-Works 36
Determination of Sulphur in Gas 37

REGISTER OF PATENTS.

Manufacture of Coal Gas—Johnson, J. Y. (The Deutsche Continental Gas Gesellschaft and Julius Bueb) 38
Gas-Burner with Lighting Attachment—Nielsen, C. 38
Testing the Joints of Pipes—Glover, J. . . 39
Generating Incandescent Gas-Light—Hudler, J. 39
Incandescent Gas-Burners—Wilkinson, J. F., and Gregson, T. 40
Hydraulic Mains—Beard, G. F. H. . . . 40
Prepayment Sale and Delivery Mechanism for the Supply of Gas—Hawkyard, J., and Meters, Limited. 40
Atmospheric Gas-Burners and Automatic Controllers for Same—Cox, G. J. . . . 41
Incandescent Gas-Burners—Adams, W. W. . 41
Manufacture of Incandescent Gas Mantles—Hill, H. 41
Inverted Incandescent Gas-Lamps—Steinicke, T. 41
Patent Notices 42

MISCELLANEOUS NEWS.

Poisoning by Coal Gas 43
Public Companies and the Opening of Streets 44
Manchester Corporation Gas Undertaking—The Past Year's Work 44
Loans for Gas and Water Purposes in Ireland 45
General Gas Company of France 45
Oldham Electricity Works—The Question of Depreciation 45
Failures of the Electric Light 45
Torpoint Water Supply 46
Bradford Water-Works Arbitration—Awards in the Nidd Valley Estates Claims . . . 46
Notes from Scotland 47
Current Sales of Gas Products 48
Coal Trade Reports 49
Trade Notes 50
Stock and Share List 50

PARAGRAPHS.

The Earl's Court Exhibition Medal . . . 19
Gauging the Discharge of Water-Mains . . 21
Fifty Years' Service—A Message from Sir George Livesey to his Men 26
The Gas Referees and the Gas Supply of the Metropolis 29
Professor Nichols on Photometry 35
Engineers and the Possession of Plans . . 38
Failure of the Electric Light at Portsmouth—Devonport Water Arbitration. 42
Fermoy Gas Company, Limited—The Question of Free Cookers at Rochdale—Manchester Water Supply—Gas Explosions at Purston (Pontefract) 43
Reduction in Price—Public Lighting of Falmouth—Electricity Objected to at Penrith. 45
Filtration Scheme for Pittsburg (Pa.)—Halifax Corporation Bill 46
A Water Famine at Pontefract—Gas Explosion at St. Leonards—Hurtwood Water Company, Limited—Rivington Arbitration Award 50
Portadown and Banbridge Water Scheme—Water Schemes in the Peak District . . 51

Messrs. HUMPHREYS & GLASGOW

AND

THE UNITED GAS IMPROVEMENT CO., U.S.A.

CARBURETTED-WATER-GAS PLANT

— *DOUBLE-SUPERHEATER SYSTEM.* —

H. & G., LONDON **152,300,000** Cu. Ft. Daily

U. G. I. CO., U.S.A. **432,300,000** Cu. Ft. Daily

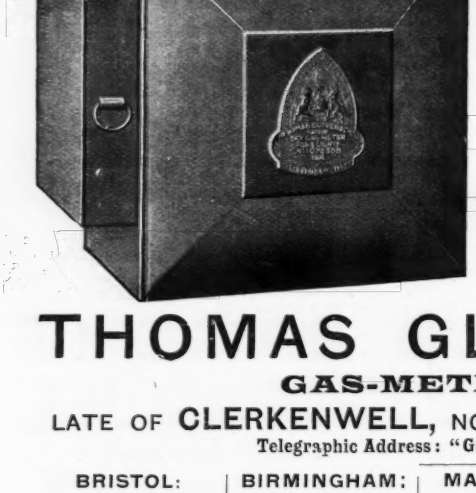
TOTAL 584,600,000 Cu. Ft. Daily

Messrs. HUMPHREYS & GLASGOW,
38, Victoria Street, London, S.W.
31, Nassau Street, New York.

THE UNITED GAS IMPROVEMENT COMPANY,
Philadelphia.

Telegrams {"EPISTOLARY, LONDON."
"HUMGLAS, NEW YORK."

THOMAS GLOVER & CO.'S PATENT NEW IMPROVED PREPAYMENT METER



For Pennies, Shillings, or any Coin.

Simple in Mechanism.
Positive in Results.
Price Changer *in Situ.*

GUARANTEED FOR FIVE YEARS.

Telegraphic Address: "GOTHIC, LONDON." Telephone No. 6159 Bank.

THOMAS GLOVER & CO., LTD.,

GAS-METER MANUFACTURERS,

LATE OF CLERKENWELL, NOW 49, QUEEN VICTORIA STREET.

Telegraphic Address: "GOTHIC, LONDON." Telephone No. 6159 Bank.

BRISTOL:	BIRMINGHAM:	MANCHESTER:	GLASGOW:	BELFAST:	MELBOURNE:
28, BATH STREET.	57 & 58, BROAD STREET.	132 & 134, CORN EXCHANGE BUILDINGS.	26, WEST NILE STREET.	8, EXCHANGE PLACE, DONEGALL STREET.	23, WRIGHT'S LANE, LONSDALE STREET.
Telegraphic Address: "*GOTHIC.*"	*Telegraphic Address:* "*GOTHIC*"	*Telegraphic Address:* "*GOTHIC.*"	*Telegraphic Address:* "*GASMAIN.*"	*Telegraphic Address:* "*GOTHIC.*"	
Telephone No. 1005.		**Telephone No. 3898.**	**Telephone No. 6107 Royal.**		**Telephone No. 3713**

PARKINSON'S PREPAYMENT METERS

For Pence, Shillings, or any Coin.

SIMPLICITY . .
DURABILITY . .
EFFECTIVENESS } COMBINED.

PARKINSON AND W. & B. COWAN, LTD.
(*Parkinson Branch*),

COTTAGE LANE, CITY ROAD, LONDON. | BELL BARN ROAD, BIRMINGHAM.

JOURNAL OF GAS LIGHTING, WATER SUPPLY, &c.

EDITOR & PUBLISHER: WALTER KING. OFFICE: 11, BOLT COURT, FLEET ST., LONDON.

VOL. LXXXIX., No. 2173.—TUESDAY, JANUARY 3, 1905.

EDITORIAL NOTES—GAS, &c.

Fog and Gas.

It was rather hard on Mr. F. J. Brodie that the adjourned discussion on his paper entitled "Decrease of Fog in London "during Recent Years," which took place at the Institution of Civil Engineers last Wednesday week, should have synchronized with the occurrence of one of the worst of a series of fogs which is without parallel since the year 1891. In Mr. Brodie's opinion, as expressed in his paper, there has been a marked decrease of fog in London during the past thirteen years; and this he attributes in a great measure to the efforts of the Coal Smoke Abatement Society and the more general use of improved gas-stoves and grates. Seeing, however, that there must have been grave questionings among those who were present as to the chance of getting home that evening (traffic being dislocated in every direction owing to fog), it is not surprising that this view was not accepted with any particular enthusiasm, and that more than one speaker declared that it was impossible to abolish fog. At the same time, it is generally conceded that fogs are less filthy than they were formerly. This is the opinion of correspondents of the "Daily Telegraph," and was expressed in a leading article in "The Times" on the 24th ult.

"The Times" attributed the change to the extent to which the production of smoke in the Metropolis has been diminished by legislation; but this very naturally called forth a letter from Sir George Livesey, which is reproduced in another column, in which he does a service to the industry by pointing out the efforts which the gas companies have successfully made during the last few years to extend the use of gas heating and cooking appliances. He also refers to the greatly extended employment of gas-engines as having caused a diminution of smoke from factories. But the main producers of smoke in London are, or have been, domestic fires. Now, however, thanks to the substitution of gas heaters and cookers, the complaint of the chimney sweeper is heard in the land, for his industry is a decaying one. Nevertheless, fog has not yet been abolished; nor, with all respect to Mr. Brodie be it said, is there much sign of its abatement. It is true during the last few years there has been comparative immunity from it; but the present season has already done much to bring up the average.

In a recent article in "The Times," the subject of fog is exhaustively treated by a scientific contributor. Starting with the familiar fact that the amount of water that can be held in the atmosphere in the form of vapour is limited, but varies with the temperature, it is explained that, given a quantity of air containing vapour, and subjected to any cooling process, such as mixing with a colder air, the capacity of the vapour to remain in its invisible condition diminishes till the dew or saturation point is reached, after which any further cooling results in the production of a cloud or fog, from the condensation of some of the vapour into its liquid form. The vapour molecules cannot, however, of themselves combine to form cloud particles, a solid or liquid nucleus being required on which the vapour molecules can condense. This is furnished by the dust and other impurities in the air, the number of particles of which in towns amount to from 100,000 to 200,000 per cubic centimetre; whereas in purer country air the number is much less, and in exceptionally pure mountain air it may fall to 200 or even lower. Herein lies the chief difference between town and country fog; the latter being formed of vapour condensed on a few particles of dust, resulting in a coarse-grained form of condensation, whereas in the former the same quantity of vapour is distributed over a very large number of dust particles, resulting in a fine-grained fog. This is much more opaque than the coarse-grained country fog, owing to the light passing through the former meeting with a greater amount of dispersion. This would seem to furnish a clue to the means by which improvement may be effected. Abolish smoke, and the air will no longer contain solid particles. Remove the latter, and it might be argued fog will become impossible. It is, however, pointed out in the article that "it is "not the large-sized visible dust that does the damage; it "is the infinitely small, ultra-microscopic particles produced "by the combustion of coal, coke, and gas which are re-"sponsible for the very high number of particles." All forms of combustion, in fact, no matter what the fuel may be, give rise to these very small particles of dust which are active nuclei of condensation. Even hydrogen gas, prepared under the usual laboratory conditions, when burned in dustless air, produces enormous numbers of dust nuclei; and only from absolutely pure hydrogen burned in dustless air is a form of combustion obtained which does not give rise to nuclei. It is not, therefore, surprising to be told that, though the burning of coal does add much to the disagreeable character of fogs, its abolition is not likely to reduce to any great degree either the density or the frequency of town fogs. One—and perhaps the greatest—benefit from such abolition would, it is stated, be the absence of the sulphur compounds produced when coal is burned, because the products of the combustion of sulphur give rise to a kind of condensation nucleus which has a strong affinity for water vapour, and tends to produce fogging before the air is cooled to the saturation point.

Over 200 tons of sulphur are burned every day in London; and the effect of the products from this quantity must be very great in increasing the density of London fogs, and also in causing them to form prematurely. The remedy for this is the substitution of gas for coal, but obviously not the "cheap" forms of gas, which all contain a large amount of sulphur. It is only by means of purified gas, as supplied in every town, that this improvement can be effected. At the same time, it is desirable to bear in mind that the meteorological conditions are the prime factors in the formation of fogs; while the impurities in the air only alter their character. Fog does not form, either in town or country, so long as a constant current of air is flowing with a fair velocity, because then the vapour constantly rising from the ground is at once carried away. It is only when the current fails and the air gets stagnant, that the rising vapour accumulates and foggy condensation is likely to take place. There must, then, always be a liability to fogs; and all that can be hoped for is a reduction of their more disagreeable elements by the general use of gas and smokeless fuel, of which latter gas companies are, as Sir George Livesey mentions in his letter to "The Times," large producers in the shape of coke.

Sir Oliver Lodge has proposed to effect the dispersion of fog by means of electric discharges, but admits that this can only be applied to a very limited extent. He is, indeed, a believer in the efficacy of smokeless fuel to an even greater extent than the scientific contributor to "The Times," from whose article we have quoted. In an interview with him which was recently published in the "Pall Mall Gazette," he expressed the opinion that "the primary cause of town "fogs is the open grate; and I would, if it were possible, "prohibit the use of crude coal in cities, towns, and other "thickly-populated districts. We should then have no "more of these terrible fogs." "The only possible final "solution of the problem is to abolish the use of coal "and substitute for it gas for domestic purposes." Whether, however, looked at as a complete remedy, as Sir Oliver Lodge regards it, or merely as a palliative, gas is likely to be in equal and increasing demand. But Sir Oliver's ideas on the subject of an ideal gas supply are hardly such as will commend themselves to any having a practical acquaintance with the subject. He says that what is wanted is gas of a lower calorific value than the present coal gas; and this should be made, where possible, at the mouth of the coal-pit (thus saving at the very outset all the cost of the carriage of coal),

and carried by large mains to the consumer. Gas of this quality (meaning something between Mond and ordinary town gas), it should, according to him, be possible to make and deliver at a cost of 6d. per 1000 cubic feet. Until this comes along, apparently—and it is not likely to come any faster because Sir Oliver believes it to be possible—he is quite content to endure "the comfortable coal-fire" to which the directed the attention of his interviewer as an argumen in favour of gaseous fuel! Surely, however, the truest practical philosophy is that which makes the most of what is within reach; and a gas-fire should certainly be within reach of Sir Oliver Lodge, who would do well to remember that every additional gas-fire or gas-cooker brought into use must bring nearer the time when the employment of gaseous fuel will become, as he so much desires, universal.

The gas industry is in fact doing its best to spread the use of gaseous fuel, and mitigate as far as possible the inconvenience caused by fogs. In doing so, the gas manager is never free from anxiety as to the maintenance of his supply, and least of all during the winter months, when he has need of all his watchfulness and resource. He must not permit himself to be lulled by a sense of false security, or misled by a mistaken estimate as to the probabilities. Experience has shown over and over again that anything is possible as regards gas consumption down to Christmas Eve, and particularly when, as happened last year, this falls at the very end of what is usually the busiest week of the season. The present season has, so far, been a particularly trying one. Severe frosts in November caused an unusually early and (for the time of year) exceptional demand. Then followed a spell of very mild weather, which, coming so close to what may be termed the turn of the season, was calculated to dispel any idea of impending recurrence of extreme demand. The unexpected, however, happened; and there followed an unprecedented demand for gas which must have severely taxed the resources of undertakings wherever fog prevailed. It speaks well for their organization that they passed through the ordeal so satisfactorily, as was shown by the figures published in last week's issue and the present number.

Only two cases of partial failure of supply are reported; one being that of Manchester and the other of a part of the district supplied by the Commercial Gas Company. It is, however, to be noted that both the undertakings affected employ carburetted water gas; one of the great advantages rightly claimed for this being that the plant for its production can be started to work in a few hours, whereas coal-gas retorts require almost as many days before they can be made fully available. Why, therefore, in such an emergency this plant did not, according to appearances, act the part of a friend in need, seems to require some explanation. On the other hand, the South Suburban Gas Company, who have lately discarded (except for emergencies) carburetted water gas, upon which they had largely depended for several years, did very well indeed without it, lighting up the plant only towards the end of the week as a measure of precaution; while the South Metropolitan Company exceeded their previous record twenty-four hours' consumption by about 5 million cubic feet, and could, according to the Chief Engineer (Mr. Charles Carpenter), have gone on throughout the week at the same rate. This Company, as is well known, have no carburetted water-gas plant. It will have been observed with satisfaction that at Birmingham a greatly increased demand was met; the previous record being exceeded by about 1¾ million cubic feet, despite the difficulty under which the Gas Department still labours from the destruction of plant by the recent disastrous explosion. Glasgow, also, as reported this week, has established a record output by about two million cubic feet. The Gaslight and Coke and the South Metropolitan Companies are to be heartily congratulated on the increases which they secured for the two worst days of the fog—namely, Wednesday and Thursday—these totalling to nearly 58 million cubic feet, which is equal to a full year's consumption of many a good-sized town. They convey an excellent idea of the needs of the public on such occasions, without the satisfying of which serious disaster must inevitably result. At the same time, they appeal very forcibly to the self-interest of the gas manufacturer, who may regard a fog, not as an untoward incident to be tided over by some such expedient as a reduction of pressures, but rather as a golden opportunity to render a highly important and necessary service to the whole community, while filling the coffers of the undertaking.

Proposed Gas Legislation for the Metropolis.

In our last issue, a summary was given of the Bills having reference to the Metropolis which have been deposited for introduction next session. These are promoted respectively by the three Metropolitan Gas Companies acting conjointly, the London County Council, the South Metropolitan Company, and the South Suburban Company. The main objects of the Bill promoted by the latter Company are the removal of existing restrictions with regard to the presence of sulphur impurities other than sulphuretted hydrogen, and a reduction of the illuminating power to 13 candles. The provisions for testing for illuminating power are substantially the same as those in the Joint Bill of the three Companies, to which reference will presently be made. Other provisions of this Bill do not call for any particular comment.

The object of the Joint Bill of the three Companies is to repeal certain enactments relating to testing for illuminating power and purity, and to substitute for them others as set forth. It provides also for the abolition of Sunday testing, and for extending the powers of the Chief Gas Examiner, so as to enable him to decide as to what penalty (if any) is to be imposed in the event of default either in illuminating power or purity, in lieu of the present procedure by summons before a Police Magistrate, and to act as arbitrator in case of any dispute arising between the Gas Referees and the Companies or any one of them. Needless to say, it does not provide for testing for sulphur compounds other than sulphuretted hydrogen, or for calorific value, or for illuminating power with a flat-flame burner. As regards purity, the gas supplied is to be, as far as practicable, free from sulphuretted hydrogen; but no penalty is to be incurred unless the quantity of this impurity present exceeds 1 grain per 100 cubic feet. This is an eminently fair and reasonable proposal, which cannot be said of the present method of testing for this impurity. At the same time, there does not appear to be any good reason why the provisions of the Gas-Works Clauses Act, 1871, should not in this respect suffice for the Metropolis. Equally fair are the provisions as to testing for illuminating power and purity. A Gas Examiner is to make tests at any testing-place on such days (exclusive of Sunday) as the controlling authority shall direct, for ascertaining whether, during the whole of such day, the illuminating power and purity are such as are respectively prescribed. The testings for illuminating power are to be three daily, at intervals of not less than one hour. If the average of the three falls below the prescribed illuminating power, a fourth is to be made. The average of all the testings of the illuminating power and purity of the gas supplied at a testing-place on any day on which the tests shall be made, is to be deemed to represent the illuminating power and purity of such gas on that day. It is further provided that no forfeiture for excess of impurity can be recovered in respect of gas supplied to more than one testing-place on the same day. The gas under examination for illuminating power is to be kept burning so that the height of the flame is about 3½ inches for at least 30 minutes before any test is made. This is a very necessary provision, as every practical gas tester knows, if underestimation of the value of the gas being tested is to be avoided.

Next in importance to the proposed repeal of the restrictions as to the presence of sulphur compounds other than sulphuretted hydrogen, are the clauses which relate to the testing for illuminating power. The burner is to be the same as now used—Sugg's No. 1 "London" argand, with a 6 inch by 1⅞ inch chimney; and the standard of comparison is to be Harcourt's 10-candle pentane lamp, also as at present. The photometer, however, is to be the table photometer in use at the passing of the Act, but modified by having the prescribed burner carried on a traversing slide. The object of this modification becomes apparent from the succeeding provision, which is that the gas under test shall burn with a flame of such a length that the irregularities of its upper edge appear to be equally divided by an imaginary horizontal plane 3½ inches above the upper surface of the steatite ring of the prescribed burner. In other words, the Companies propose that the gas shall be tested with a fixed height of flame (this height to be 3½ inches), instead of being burnt at such a rate as to give a 16-candle illumination, as at present. This change involves a slight moving of the burner in the event of any variation of illuminating power; and hence the need for it to be carried on a traversing slide.

Such are the main features of a method which commends itself to the Companies, who supply gas differing widely in character and composition—that of the Gaslight and Coke and Commercial Companies being a mixture of coal gas and carburetted water gas, that of the South Metropolitan Company coal gas alone.

It is many years since Mr. Charles Hunt contended for the observance of a uniform height of flame, which he proposed should be determined by the capacity of the chimney; the gas to be consumed at such a rate as to fairly fill the chimney with flame, without causing tailing over the top or smoking. This was probably suitable for coal gas alone; but the advent of carburetted water gas changed the conditions, because this gas requires less air for its combustion than does coal gas. The height of flame proposed by the Companies has doubtless been fixed upon as being applicable to mixtures of gases as well as to coal gas alone, and therefore the most suitable under present circumstances. Its adoption would thus not only settle once and for all, upon a satisfactory basis, this question of method of testing as regards the Metropolis, but it would also pave the way to uniformity of testing throughout the country—a result which is in every way to be desired. There are other provisions in the Bill which relate chiefly to methods of procedure. From what has been said, however, it will be seen that the Companies have produced a thoroughly workable measure, the provisions of which, while not unduly onerous upon them, afford ample protection for the consumers.

The Bill of the London County Council betrays a far less practical spirit. It is full of what, regarded from a practical point of view, are of little value, in the shape of testings for illuminating power as ascertained by means of a flat-flame burner, for calorific value, and for sulphur compounds other than sulphuretted hydrogen—all to be made and recorded without any penalty attaching to the results found. This abolition of penalties is, however, as regards sulphur compounds, conceded with very bad grace, since it is proposed that the "Gas Referees shall from time to time report to the "Board of Trade whether any (and, if so, what) method "which will not cause a nuisance in the neighbourhood of "the Company's works can be adopted for the removal "from gas supplied by the Company of sulphur impurities "other than sulphuretted hydrogen; and upon any such "report, the Board of Trade may, if they think fit, and they "are hereby authorized to, make an order applying to the "Company the provisions of any Act relating to the Com-"pany with reference to sulphur impurities other than "sulphuretted hydrogen and forfeiture in respect thereof." That is to say, relief from penalty testing is only to be tentative, and to cease when the Gas Referees can point out a method for the extraction of these sulphur compounds which can be employed without causing a nuisance in the neighbourhood of the works. There is not a word about the possible cost of such a process, or how this is to be borne, which is particularly noticeable, since it is coolly proposed to mulct the Companies by taking 1d. off the standard price of each of them, although the Board of Trade Committee found that the pecuniary advantage attending the relaxation of the requirement with respect to sulphur purification was not, "in itself, sufficient to justify them in recommend-"ing any consequential reduction in the standard price of "gas." How, moreover, the London County Council can reconcile their present attitude on this question with another finding of the same Committee—namely, that "those who "contend for the maintenance of the clauses relating to "sulphur compounds (other than sulphuretted hydrogen) "have not sufficiently shown that their abolition in the "case of the London Companies would be detrimental to "the public"—remains to be seen. The unnecessary and mischievous character of these restrictions has been fully exposed; and it will be surprising indeed if the matter be reopened as is apparently desired by the London County Council. There is, as might be expected from its source, the puerile provision that the gas supplied by the South Metropolitan and Commercial Companies is to be known as of 13-candle illuminating power, instead of 14 as heretofore. Other provisions relate to service-pipes to testing-places, which are to be connected "with such main or mains "as may be prescribed by the Gas Referees;" and to the enlargement of the powers of the Chief Gas Examiner. Except for the brilliant idea of knocking 1d. off the standard prices of the Companies, which is a kind of sop to consumers, this Bill might be described as having been framed in the sole interests of the noble army of Metropolitan gas testers.

The chief object of the South Metropolitan Company's Bill is to secure the abolition of the Gas Referees. The preamble states this to be desirable because their "remunera-"tion and the fulfilment of their requirements have imposed "a large expenditure upon the Companies which would other-"wise have been available for reductions in the price of gas, "without detriment to its quality and its illuminating power." There will be general agreement as to this. As has been already remarked in these columns, Gas Referees can no more be wanted in London than they are anywhere else within the United Kingdom; and they have for many years completely lost touch with the gas industry and with the objects for which they were originally appointed. To put an end to this anomalous state of things, the Company are willing to pay the Gas Referees as compensation for their loss of office a sum equivalent to seven years' purchase of their annual fees, which must be regarded as erring, if at all, on the side of liberality. The Bill contains full directions as to testing; this being made necessary by the contemplated abolition of the body by whom such directions have hitherto been issued. It likewise provides that the powers of the Chief Gas Examiner may at any time be extended by the Board of Trade, so as to enable him to undertake such as may be necessary of the duties previously performed by the Gas Referees.

The consideration of these Bills in Parliament promises to be of exceptional interest, since the fight in which the Metropolitan Companies are engaged is one for greater freedom for the whole gas industry. Everyone interested in the industry must therefore wish them success. The forces of reaction, however, are only scotched, not killed, and every effort will be needed to effect their final overthrow.

The "Profession of Gas Engineering" in America.

In matters polemic, it is interesting to observe how different minds often regard one subject from different standpoints, and arrive at very dissimilar conclusions, all being plausible, and yet contradictory the one to the other. It is desirable that it should be so, because it is by liberal examination and discussion by many men, and by ascertaining the reasonings that have prompted decision, that eventually truth or the ultimate and irrefutable conclusion is attained. The world is now conservative enough in all conscience, though perhaps it is not so bad in this respect as it was even only a quarter of a century since; and the world would become a very stereotyped sort of place, in man, customs, and affairs, if we were all animated by one mind, and saw only from one point of view. In gas engineering, as in most other matters, this applies; and therefore in gas engineering, we hold, that the greater the number of minds that can be brought to bear upon it, the greater the breadth of view given to it in its many phases, the greater the discussion, the better for gas engineering. But in this we are evidently not supported by a writer in the "American Gas-"light Journal," who, discussing in an article of about two columns' length, under the incongruous heading of "Briefly "Told," the subject of the "Profession of Gas Engineering "in the United States," submits propositions and illustrations which, perhaps unintentionally, do not harmonize. With the former, we doubt not—if we properly know our American friends—there will be almost general disagreement. While the writer in our American contemporary is against individual stereotyping, and what he is pleased to call the "exploitation" of individual hobbies, he advocates a practice that must conduce to a worse condition, by, as it were, petrifying engineering practice, and taking away from it that mobility which comes from many minds bearing upon it, and which hastens the pace in progress.

It is confessed by the writer, whose article is signed "P," that the profession of gas engineering in the United States has never been much more than a name; and though very creditable engineering work has been done, it has been chiefly by apparatus builders and the superintendents of gas companies. Yet it is very questionable, in his view, whether the progress of business would be benefited by a nearer approach to English or German methods, as it appears to him that the attempt to cover all the ground by the genius of one man has resulted, in England more particularly, in unnecessarily increasing the cost of engineering structures by (as previously mentioned) the exploitation of individual

hobbies, and by tying them up with impracticable specifications. Here we have the kernel of his whole argument; and it is composed of four things: First, that the "profession " of gas engineering" in the United States is nothing much more than a name; secondly, that the work that has been done has been chiefly by gas plant contractors; thirdly, an argument for the continuation of that system; and, fourthly, an indictment of the English and European systems of, as far as possible, having a competent engineer on the works who not only knows how to operate his plant, but who is able to design it, and to defend the interests of his employers during both its construction and its subsequent working life.

The experience of "P" as to the results of English and German practice stands condemned as deficient by the numerous examples of cheaply constructed and economy producing gas plants in this country and Germany which have been designed by the engineers in charge, as well as by his own subsequent confessions. "Individual hobbies" will always be found not only in the gas profession, but in the works of contractors; and, on this side, we refuse to recognize a man as an engineer who cannot draw up a specification without impracticable conditions attaching to it. It is by the system of the past, by the combination in the one man of the engineer and the manager, that in these isles, in Germany, and in other European countries, so much progress has been achieved. On the other hand—accepting as correct the statement made in our American contemporary—the profession of engineering in the United States "has "never been more than a name." What has been the result of the one system as compared with the other? We look to "P" to supply the answer by his own illustrations, though they do not nearly exhaust the list of what runs through the mind. But they will suffice. With all the inventive talent in the United States, few useful inventions in the manufacture of gas can be credited to that country. The United States has "an ancient claim on the present "meter-valve, which was invented by Bogardus, but was patented and introduced in England by Sullivan;" water-gas was invented in England and France; gas was conveyed in England, at Beckton, under a higher pressure than the distributing pressure, long before it was done in the States; cast-iron banded tanks were commonly used in Europe many years ago, and the original Beckton tanks were partly of wrought-iron plates; and a large wrought-iron tank was built in Leeds about twelve years ago. This, it is believed, completes the list of what the writer calls "fundamental" American inventions; but it is clear that America cannot establish a very clear title to any of them. This being so, it is passing strange that "P" should advocate the perpetuation of a system that has produced so little fruit of sterling value. Knowledge of the type of men who are now controlling, in an official capacity, the gas supplies of America leads us to think they are not of the same mind as "P," and they will not be content until they occupy a position in the van of gas-works invention, and justify not only nominally but *de jure* the title of engineer.

The writer asserts that the American manufacturers are to-day better able to design gasholders, tanks, retort-benches, generators, and other apparatus than the gas companies themselves. If this be so, then it is not to the credit of the latter nor to the common good. There should be something of an equality in this regard on both sides. The argument that the system which has operated in the past has not only relieved the companies of every engineering expense, but also of responsibility for the design, is frail. It is a declaration of innate weakness in a gas companies' organization. Some one has to pay for the manufacturers' engineering expenses, and that some one must be the gas companies. And as to responsibility, if the companies do not possess an engineer qualified to design, then they have not a man capable as an engineer of advising them, and of adequately protecting their interests during the construction and the subsequent operation of the plant. "P" recognizes that, with the larger extension of the gas business, plant of greater magnitude, and consequently of greater value, is now required, and that this imposes increased responsibility upon the manufacturers, and, we assert, on the companies who employ the manufacturers. Then it is a matter of growing importance to the companies to be in a position to see, through their own qualified engineer, that, both in design and construction, every new work is efficient. It is not a soundly based argument to say that because things have gone on very well indeed in the past, the same system will answer equally well under the changing and vastly more important conditions of the present and future; and it savours somewhat of an incompetency to keep pace with the times to advance the plea, as a reason for the maintenance of the old order, that "many "of the older engineers and designers have not had the "necessary technical training to enable them to deal "successfully with new and untried conditions." It is difficult to follow the philosophy of a man who argues thus, and then writes in a declamatory spirit of those younger men—"picking out all the flaws" in their character, and no good encouraging points—who are qualifying by acquiring a groundwork of technical knowledge before entering the practical sphere. It is admitted by the writer that the knowledge of the technical engineer and the wisdom of the practical class are both required to work together to make the best progress; but he does not think that the knowledge of how to build gas-works and how to run them are often to be found in combination in one man. This, if true, is a bad thing for the gas engineering profession and also for the industry; for the most successful engineering is to be found where the two talents are blended. And how is it possible that the purely constructional engineer, always engaged at the contractors' works—excellent as those engineers are in structural matters—should have the knowledge necessary to the future running of the works they build? Gas engineering, without the promptings of the practical working of the plant, would tend to standardization in design, and would not offer a sufficient expanse of ground upon which to work for progress. Therefore, it is impossible to unite ourselves with "P" in the view that the business of the office gas engineer should become merely "advisory and in-"quisitorial." On the whole, we are not inclined to think that "P" represents the views held by the gas profession of America, nor that its members will be altogether prepared, in this matter, to accept him as their "guide, philosopher, "and friend."

Trade Unions and the Unemployed.

Trade Unions miss very few opportunities of expressing their opinions upon public events; and the present scarcity of employment is an event which touches them very nearly. It was therefore to be expected that they should have something to say about it; and that which they have said is interesting, not only as an expression of their views upon it, but also as a warning of what may be expected of such bodies in the future. At a conference held recently of Joint Committees of the Parliamentary Committee of the Trade Union Congress and General Federation of Trade Unions, and attended by several prominent Labour representatives in Parliament, it was declared, in the form of a report, that "the main cause which leads to large numbers "of men being without employment is due to the absence "of organization in industry, intensified by the increased "introduction of labour-saving appliances unaccompanied "by adequate reduction of the hours of labour or sufficient "increase of remuneration; the displacement of men by "women and young persons through the introduction of auto-"matic machinery; the absence, particularly in Government "works, of any attempt to regulate the distribution of work, "so as to maintain employment on an even level, thereby "causing alternate periods of rush and stagnation; and the "fact that the financial resources of the country are being "constantly drained in avoidable wars and in extravagant "expenditure." This is plain speaking, and it deserves on all sides, as it will doubtless receive, a plain answer. It might, indeed, have been less worthy of notice had it not been endorsed by such recognized Labour leaders and Members of Parliament as Mr. Richard Bell, Mr. Henry Broadhurst, Mr. W. R. Cremer, Mr. John Burns, and others. It is a transparent bid for popularity among working men. Trade Unions are made to pose as the panacea for want of employment. Industry requires more organization, which can only mean that Trade Unions should become universal, if working men desired that introduction of labour-saving appliances shall be accompanied by an "adequate reduction of the hours of labour or sufficient "increase in remuneration," or that the introduction of automatic machinery shall no longer find employment for women and young persons. Constant employment is to be brought about, forsooth, by reduction of the hours of labour or increase of wages; for that is what it amounts to.

This cynical avowal of the aims and objects of modern Trade Unionism shows that there is practically no limit to its demands. It would deny to the manufacturer the benefit of his machinery, and thus deprive him of the means of meeting competition, without which, probably, he cannot go on. This, however, seems to be the very way to create a dearth instead of a sufficiency of employment. Capital, as a recent writer in "The Times" has remarked, is a notoriously shy bird, but possessed of uncommonly strong wings. "It can fly off to another country just as "easily as to another town; while to its owner the exact "destination is immaterial, provided the dividends are satis-"factory. But the direction of its flight, as existing condi-"tions show, may be a matter of serious concern for British "workers." We are not prepared to endorse the opinion which has been expressed, that capital has to any great extent taken to itself wings, and left this country for employment elsewhere, in consequence of the unreasonable attitude of workmen. But that there have been instances of industries starved out of existence by such attitude is undeniable; and the opinion of this conference on the question of the unemployed shows that the impracticable spirit still exists, and only needs the opportunity to manifest itself. At the same time, it is greatly to be desired that the workman should, in some form or other, participate in increasing prosperity. That he should do this merely by working longer hours when trade is brisk is not satisfactory. Exceptionally long hours of labour are not in the interests of either employers or employed. What is wanted is that the workman shall have an active interest in the work in which he is engaged, beyond the mere fact of having to occupy himself so many hours for so much money. Co-partnership, as practised at the South Metropolitan Gas-Works and elsewhere, does give him that interest; but Trade Unions are averse to it, and even to any approach to it, as witness their recent attitude on the Premium Bonus question. Their aim apparently is to keep all workmen on the same wages level, and obtain such a distribution of employment as will always ensure more or less work for all. Both objects appear to be impracticable, and the pursuit of them is fraught with mischief to the community. Even if the work which has to be carried out by the Government and public authorities could be regulated as desired by the Trade Unions, which is impossible, it would still remain to control the ebbs and flows of trade, both home and foreign, so as to form them into one steady current. Nothing would please the manufacturer better. What he wants is, not a boom in trade and then depression, but a period of good steady trade. What the capitalist wants in this respect, but cannot always obtain, labour is also powerless to effect.

It is not our purpose in this article to deal with the remedies proposed by the conference for scarcity of employment, but one of the suggestions calls for remark. Public bodies have been recently formed in London, at the instance of the Home Secretary, for the purpose of dealing with the existing distress. The Trade Unions suggest that similar local bodies, with the addition of a considerable proportion of direct Trade Union representatives, shall be permanently established in all localities throughout the country; and, further, that the Trade Unions of the country shall be one of the agencies recognized as empowered to deal with unemployment. With regard to this, it must be said that the attitude of Trade Unions towards workmen who do not belong to them has not hitherto been such as to inspire confidence in their impartiality in a matter of this kind; nor would they be free from suspicion of a desire to extend their influence and increase their membership. In the interests of industry in this country, this is about the last thing to be desired, having regard to the avowed tenets of Trade Unionism; and it is therefore much to be hoped that funds subscribed for by the public will not be entrusted to their control, but to that of public bodies who may be fully relied upon to dispense them impartially—to Unionist and non-Unionist alike—in strict accordance with the necessities of the cases.

Vertical Retorts and Naphthalene.

Gas technicians have long been persuaded of the truth that present-day high temperatures of carbonization are responsible for the formation of their most objectionable enemy—naphthalene; and a great deal of attention has been paid to the question of how to relieve the produced gas of its naphthalene content in order to obviate subsequent trouble. But strange to say, there has been little serious attention bestowed on the point as to whether, while enjoying the advantages of high temperatures in carbonization, something cannot be done to prevent the formation of naphthalene at its seat of origin. Its formation, in fact, appears to have been accepted as an irremediable evil which must accompany the benefits derived from the employment of high carbonizing temperatures. In view of this, we direct attention with especial pleasure to the claims, as set forth on p. 28, of the Deutsche Continental Gas Gesellschaft and Dr. Bueb, in connection with a further invention which they have made in the vertical retort system. The invention so far as the arrangement of the setting goes (to the extent that judgment can be based on the patent description and illustration) is not so strikingly novel as the discovery which has resulted from the experiments with the vertical retorts, and of the truth of which the patentees appear to be abundantly satisfied. Now what they assert is in effect this, that even employing higher temperatures than is usually the practice, coal can be carbonized, under certain conditions, in vertical retorts, and the gas leave them without naphthalene being produced. If this is so, then the vertical retort has here scored an important consideration. Coming from these careful and persevering investigators into the vertical system of carbonization, their belief is not open to challenge until, if ever, they themselves, or some equally capable experimentalists, prove the statement to be an error.

The Passage of the Gas and the Effect.

As the result of the experiments in Germany, it has been found that the formation of naphthalene does not necessarily follow, or accompany, the separation of the gas from the coal, but takes place as soon as the heavy hydrocarbons contained in the gas distilled from the coal are heated beyond a certain temperature. In the new arrangement of vertical retort setting, Dr. Bueb and those who are working with him have abandoned the inclined outlets they originally adopted through the length of the retorts for the passage of the gas into external collecting chambers; and the retorts in the present arrangement are constructed of taper form, with the smaller part at the top. The retorts are kept full of coal to a level corresponding to that to which they are heated. The settings are so constructed that the gases by which the retorts are heated pass around them in several superimposed zones, in the lowermost of which the temperature is highest, and is decreased in the zones above. The object of this will be clearly seen. What happens, according to the patentees, is this: "Owing to the great heat, gas is very quickly generated from the portions of the coal in contact with the internal surfaces of the retorts, and such portions are at once converted into compact coke, which is impermeable to the gas generated. The gas therefore passes from all points of the periphery inwards and upwards through the uncoked, and easily permeable, portions of the charge. By the passage of the gas through the inner uncoked and cooler parts of the charge, the temperature of the gas is prevented from rising beyond the limit at which the heavy hydrocarbons of the gas would be decomposed into naphthalene." The lessening of the temperature as the retorts narrow upwardly is to ensure that the formation of the crust of coke proceeds in such a manner that the carbonization of the inner core of coal progresses in a way that conduces to the passage of the gas in the manner described. We wonder what happens in the case of the gas first thrown off during the formation of the outer crust of coke at temperatures higher than those generally employed in gas manufacture. However, this is briefly the discovery to which attention is drawn through the patent specification published to-day; and the invention is the method of heating the retorts by which the result as explained is said to be accomplished. There have been certain experimental trials of vertical retorts in this country charged completely from top to bottom; and, from what we hear of the experience of the temperatures in those experiments, if gas is passing from the newest of the German arrangements of vertical retort setting free from naphthalene, we venture the opinion, without very much fear of effective contradiction, that it was also doing so in the experiments referred to. We invite correspondence on this subject.

How the Commission System is Fostered.

A few days before Christmas, a letter appeared in "The Times," over the signature of Mr. W. B. Fordham, the Managing-Director of Messrs. W. B. Fordham and Sons, Limited, containing a copy of a communication received by them, which for impudence would, in colloquial language, take a lot of beating. The writer suggested that, in view of the nearness of Christmas, the firm should follow the example of their rivals and several other firms in the line, and, as a means of increasing their business, "remember the buyers." They were assured that this consideration was greatly appreciated, and that the result would be mutually beneficial. "One good turn," it was remarked, "deserves another." We have so frequently condemned the practice of begging for beanfeasts and cadging for commissions, that we should not have noticed the letter had its publication not been the means of bringing one from a correspondent signing himself "A Kentish Gas Manager," which reveals a condition of things in connection with municipal trading which is not creditable. The principal point made by the writer (who is well known in gas-managing circles) is that local authorities who own undertakings such as gas, water, and electric light works, put every possible inducement in the way of their officers not only to accept commissions, but to do all they can to secure them, by the "niggardly salaries they pay, and the contemptible manner in which these officers are constantly treated." He cites a case in which an applicant for a position as the head of a department accepted it (declining another which had been offered to him), at an admittedly moderate salary, on the understanding that if he succeeded in improving the working results he was to have a material share therein after the lapse of a twelvemonth. The Committee who had to make the appointment readily agreed to this; but two years later, the Council, while acknowledging the improvements effected by their officer, repudiated the agreement upon which they secured his services, and refused to make any increase in his salary beyond one provisionally granted, which did not amount to half the minimum asked for. The writer remarks, on this bit of sharp practice, that it is evidently of no concern to the Council that "honesty is no policy" in the case of their official, who is probably voted a fool for not doing what is being done by many men in similar positions—that is to say, "making up for a lack of principle by an abundance of bawbees easily extracted from a very large class of contractors who are only too willing to purchase business on these terms." He adds —and we cordially endorse his observations—that it is shameful that in the conduct of such municipally owned concerns as those in question an official should either be induced to enrich himself and provide for his family *sub rosâ*, at the expense of the ratepayers, or, if a man of integrity, be "financially starved and incessantly worried, to the great detriment of the concern's best interests as well as of his own." It may be that the zeal displayed by the official referred to—while distinctly benefiting the finances of the town—has indirectly affected the pockets of certain members of the Council, and they, consequently, are not inclined to regard him with a very favourable eye.

The Necessity of Discriminating.

The desire for economy is becoming pronounced with some of the municipalities—at least, in small things. Even this is something to be thankful for, if properly given effect to; but there is such a possibility as false economy, and this is where the need for discrimination comes in. In many quarters a dead-set has of late been made at deputations, sometimes owing to the seeming inability of a councillor or councillors to distinguish between a picnic and a journey in search of useful knowledge, and thus mistaking business for pleasure. A notable instance of this topsy-turvydom has lately been witnessed in the Stoke Town Council, certain members of which protested both loud and long against the action of the Gas and Electricity Committees in sending a deputation of members and officials to the exhibition at Earl's Court and the Plumstead electricity works. It appears that not even the whole of the Committees went, and that the total cost of the visit was about £40. What terrible extravagance! Only fancy a Corporation spending such a sum (and all at once, too) on acquiring knowledge that must be of inestimable benefit to them in the conduct of enormous business undertakings! And how logical were the arguments adduced in condemnation of the action. This was an inopportune time, said the gentleman who brought the matter to the notice of the Council, to send out deputations—as if the exhibition was to have remained open for ever. Then, again, "the Gas Committee had a tremendous overdraft at the bank; and the Electricity Committee had about fifty consumers"—as if these were not the strongest possible reasons for seeking improved appliances and methods of working. Trade is bad, no doubt, at Stoke, as elsewhere; but if it is so bad that the Corporation cannot afford to grant reasonable facilities to those responsible for the carrying on of the gas undertaking to obtain valuable knowledge, the only conclusion that can be come to is that it is a pity the works belong to the town instead of to an enterprising company. It should be pointed out that the discussion arose over a resolution—"That in future it is desirable that the sanction of the Council be obtained by any Committee before authorizing the expenditure of money in connection with the sending of either a deputation or representatives to other towns from such Committees." There is nothing to find fault with in this proposition; but the condemnation of the particular deputation referred to was illogical and short-sighted to a degree.

Mutual Workmen's Compensation Schemes.

In connection with the report of the Home Office Departmental Committee on the Workmen's Compensation Acts, the principal points of which are indicated in another column, it is interesting to note, from the report of the Chief Registrar of Friendly Societies for the year ending Dec. 31, 1903 (the last issued), what is being done with regard to mutual schemes for providing compensation in case of injury or death. At the end of the year, 53 of the certificates originally granted expired; and in respect of five schemes no application for renewal was received. During the twelve months, one new scheme was granted; the 31 persons employed by the firm including travellers, salesmen, clerks, porters, and messengers. The payments on death range from £100 to £1000; and the allowance during incapacity is from 15s. to £6 per week for 52 weeks. The latter is allowed from the date of injury, and is in some cases quite equivalent to the usual weekly earnings. The allowance is made whether the accident occurs during the hours of employment or in the employee's leisure time, and extends (for 26 weeks) to cases of infectious disease. The firm pay one-half of the premium for insurance. How beneficial these schemes are to the men concerned will be recognized when it is pointed out that, taking the returns for the five years ending June 30, 1903, in thirty cases information was given from which a comparison might be drawn between the amount actually paid during incapacity and the maximum that would have been payable under the Act (assuming all the cases of incapacity to have been such as would have entitled the workmen to claim under the Act); and this showed that the actual payments exceeded the maximum payable under the Act by 75 per cent. This, it should be noted, was, to the extent of 65 per cent., accounted for by the provision made for the first two weeks of incapacity.

The Aggregate Results.

In the aggregate, 55 schemes had, up to the date just named (June 30, 1903), been adopted by 129,335 workmen, who during the five years contributed £214,636; while the employers contributed £329,045. The payments on death amounted to £76,053, those during incapacity to £256,531, and other benefits to £40,341; the funds being £172,408. The number of deaths resulting from injury was 769; and in 201 of these cases 1671 dependants were left, to nearly all of whom pensions were awarded in addition to the sums payable on death. The number of instances of incapacity from injury was 93,995. The Registrar remarks that, taking into account the "other benefits," £40,341, the payments during the first two weeks of incapacity and subsequent payments in excess of those provided by the Act (which if estimated to be the same in proportion as shown by the thirty schemes already mentioned would exceed £110,000), and the funds, £172,408, it would appear that the workmen derived from these schemes a full equivalent for the £214,636 they contributed. Among the undertakings that have "contracted out" of the Act in this way, there are still only two gas companies to be discovered—the South Metropolitan and the South Suburban—and in view of the statement of the Departmental Committee that they were "fully

satisfied that the majority, if not the whole, of the claims advanced in support of these schemes are, as the Act stands, well-founded," it is to be regretted that no others have seen their way to follow the example thus set.

Politics in Municipal Government.

A discussion recently took place in the Sheffield City Council which is of some interest in connection with the question of municipal management of trading undertakings. Of course, in this particular case the matter must not be regarded is in any way a personal one, but merely from the point of view of principle. That the members of town councils should be elected and the business conducted on Party lines, seems to be a pity, as a man's ability and aptitude for local government might well be taken into account before his politics. But that the management of the huge trading undertakings now controlled by citizens in all parts of the kingdom should be conducted in the same manner, is manifestly a greater pity still. The discussion at Sheffield arose over the question of the Committee Chairmanships, and was in connection with a proposition that the appointment of their Chairman by the Electric Lighting Committee should not be confirmed. The object of the motion was avowedly to arrive at a settlement of the principle whether the Chairmen of the revenue-earning departments of the Corporation, provided they had proved themselves efficient and competent, were to be dependent on the political majority for the time being in the Council. The reply made on behalf of the party in power (the Conservatives) was that there was only one principle involved—namely, that the election of the Chairman of a Committee rested with the Committee to make any selection they thought fit. The denial that there was the least difference between the Chairmanship of revenue-earning Committees and others, does not appear to be altogether well founded; for the direction of a money-making business is not merely a position of honour. It is a matter in which knowledge and experience should be the prime factors; and if a Chairman has given complete satisfaction (as seems to have been generally admitted was the case in this instance), is not that the best claim he can have to the retention of the position? One of the members put the matter aptly when he said that no one would think of turning off Sir Frederick T. Mappin from the Chairmanship of the Gas Company; and yet they turned out a man of experience who had conducted the Electricity Department splendidly for the ratepayers. Of course, as was admitted in the discussion, if the policy of the Chairman of a Committee was not in agreement with that of the party in power, and an alteration in the policy of the department was contemplated, there would be some reason for his supersession; but apparently this was not the case at Sheffield.

The Earl's Court Exhibition Medal.

It will be remembered that, at the closing ceremony in connection with the Earl's Court Exhibition, it was announced by Mr. J. W. Helps that the Advisory Committee had decided to have a special silver medal struck, and proposed to ask every firm exhibiting to accept one from them. The medals, he explained, were not intended as an "award" or "diploma;" but they would serve to remind the exhibiting firms of "one of the greatest instances of

success in hearty co-operation that had ever been known in this or any other country." The design for the medal has now been adopted, and is shown (full size) in the accompanying illustration. The sketches for the medal were submitted by Mr. Joseph Moore, of Pitsford Street, Birmingham, and the engraving of the dies and the subsequent striking of the medals themselves will be carried out by him.

ELECTRIC LIGHTING MEMORANDA.

Retrospect of the Past Year.

Within the limits from which we, as representing a competing industry, regard affairs electrical, the past year has been far from featureless; and the trend of events, from the standpoint of business rivals, has been very satisfactory. Technically, the electrical industry has registered a fair amount of progress; but in almost every department of its work, from professional practice down to the details of management, there appears to be little composure—both practice and opinions being in an inglorious state of uncertainty. From lighting and general electricity supply, attention has drifted in a very pronounced manner to the development of business in traction and power. As a matter of fact, in the original business of lighting, electricity supply has been hard hit during the year, through the greater recognition, forced by concrete facts, that incandescent gas lighting—high-pressure and ordinary—possesses the indisputable merits of superior economy and efficiency. In arc and incandescent electric lamps, there has been no new birth to attract any extraordinary notice. Street illumination by electricity has not succeeded in making headway. In spite of vigorous efforts, it has, in verity, lost ground, as is evidenced by the fact that in some of the choicest positions in the Metropolis high-pressure incandescent gas lighting has been preferred by the governing bodies; and local authorities generally do not evince much anxiety to continue piling up the bill for public lighting through electricity as aforetimes. In several places, the ratepayers have become sickened of the prodigality in this respect. The Electrical Engineer of Manchester has, however, found a simple expedient for overcoming the obstacle of cost, by regarding public lighting as a peculiarly appropriate and opportune "load"—coming just when the tramway, shop, and domestic requirements are all overlapping, and so adding to the "peak" of the day's output—and therefore, with fine logic, he claims for public lighting preference in the matter of price above all other custom. But this kind of thing will not show up well, if adopted, and if set out clearly and fairly in the annual accounts, as a piece of financial prudence. In regard to domestic illumination, consumers continue to realize the costliness of electric lighting, and that the incandescent electric lamp has the immoral habit of quickly declining from its pristine virtuous state. The application of electric incandescents for the purpose of public lighting has come almost to a standstill, save in one or two places—notably Wrexham—where the councillors are prepared to try any hazardous scheme in their distress at not being able to manage a coincidence between income and outgoings. Talking of lamps, the much-lauded Nernst lamp was brought into prominence by the application for sanction to the necessary sacrifice of a large part of the capital of the proprietary Company. In other directions, there has been no serious development of competition by electricity with gas.

While on these matters, it is noteworthy that the year produced a remarkable appreciation, on the part of central station managers, of the policy of gas undertakers in looking after the interests of their consumers, and in directly affording them special facilities. The question was raised by Mr. T. P. Wilmshurst in a paper which excited considerable attention in electrical circles, and in which it was recognized that both the incandescent gas-burners and the attitude of gas suppliers towards their customers, together with their methods of encouraging business, were important factors in the competition, which factors, if electricians desired to thrive, would have to be fairly and squarely met by them. We may therefore anticipate a development of the principle of maintenance among electricity suppliers, and even the supply of free lamps. The supply of free lamps, however, has been tried by the Bradford Corporation, with contrary tales as to success. But it is a significant comment that only last week the Electricity Committee of the Bradford Chamber of Trade reported that they had drawn up a memorial to the Corporation, asking that, instead of giving consumers free lamps, a small discount should be allowed. In Leeds, there was an outburst of enthusiasm over the popularizing of electric lighting in tenement dwellings; but the scheme—nothing has since been heard of any remarkable prosperity attending it—seems to have fallen flat. The system of electricity slot meters has been applied in places; but notable achievements in this regard have not been recorded—not even from St. Pancras, where it was proposed to serve the slot consumer on terms such as gas suppliers, with their long experience in this class of business, would not dream of "taking on" with any hope of realizing profit from their enterprise. The various methods of charging for electricity supply—simple and complex—have continued to engage the attention of those in search of fresh means of encouraging the use of electricity; but the maximum demand system does not commend itself, and remains a mystery, to consumers who have a preference for dealings in electricity on old-fashioned but easily understood methods of sale and purchase.

The municipal management of electricity undertakings has been under constant review during the year; and the introspection, in certain cases, has been rather too particular to be pleasant. Several have gone through the ordeal of public inquiry, and have not come out of it without supplying some readable if deplorable revelations. Dublin, Cheltenham, Walthamstow, and Hastings may be cited as examples; and those who follow the

story of municipal adventure in our "Electric Lighting Memoranda," will have the details of the doings in these and other places fresh in memory. There are municipal electricity concerns that are productive; there are others that are apparently so through doubtful finance; and there are others that are so hopelessly in indigent circumstances that the fact cannot be hidden from the ratepayers. It becomes more and more evident that there are comparatively few cities and towns in the country that are really capable of being cultivated up to a profitable pitch under the conditions of municipal administration; and those in which hopes have year after year been deferred make a terribly long list. By hook or by crook, the Electricity Committees try to make the business pay; but year by year the realization of the original estimates of profit appear as far off as ever. Rash additions to the distribution systems, the increase of the street electric lighting until the expense horrifies the ratepayers, the dragging in of the lighting of all public institutions, and the netting of new custom at finely cut, and often unremunerative, prices, are among the devices by which attempts are made to scoop in fresh revenue. Where the electricity supply is furnished by private enterprise, the local authorities are not so liberal in adopting public electric lighting.

One of the most satisfactory of the signs of the year has been the stand made by the Local Government Board, in the interests of ratepayers, against lavish and doubtful expenditure; and certain municipalities have had "raps over the knuckles" for exceeding, and largely in some cases—Oldham for example—the sanction in the matter of capital expenditure. In bringing forward evidence, as ratepayers, of municipal delinquency, gas companies have not received much encouragement; and their information is looked upon as tainted. It is, however, a satisfaction to find that some of it sticks, and assists in opening the eyes of the ratepayers. Marylebone has got through its preliminary troubles in connection with the acquisition of the concern of the Metropolitan Electric Supply Company; and by the time necessary extensions are made, the Borough Council will find themselves with electricity loans aggregating to about £1,650,000. Uneasy will rest the heads of the men responsible for an electricity concern carrying this undesirable form of "heavy load factor." More pronounced than ever has the history of the year made the fact that electricity supply is one which, in the common weal, is better left to private enterprise. In London the Electricity Companies have been doing a good business. But so have the Gas Companies—the Gaslight and Coke Company among them; and, as the latter presented a return to increased consumption during the year, it looks as though electric lighting in the district, so far as it affects that Company, has reached saturation-level. The Charing Cross and Strand Electricity Company proved by their accounts early in the year that competition in electricity supply means depreciated revenues. Before leaving this section of the review, it may be mentioned that numerous municipalities continue to find it a present convenience to neglect the question of depreciation. What is a present convenience is likely to produce in the future a serious and vexatious business.

The electricity or power in bulk schemes obtained a stronger footing during the year; but there is still wanting tangible evidence to prove the justification for the presumptions on which they were brought into existence. The speculation in connection with them has been of that reckless order which must, in the more sober moments of the present, make many of those who have sunk their money in them look with alarm upon such huge experimental outlay. There is a wild rush session after session among promoters to get hold of territory for power-supply purposes; and it would be a good thing for that portion of the public who do not know how to take care of their own money if Parliament would stay its hand (until there is evidence that the schemes at present under trial have justified their originators) in dispensing these favours among those who are exhibiting so much haste to annex goodly strips of the country in which to carry on their still doubtful operations. The Power Bills which have been deposited for the coming session make a formidable showing, and certain of them present a breadth of fancy for area—for instance, one or two of the schemes for London and the surrounding districts—which is remarkable. The promoters are also taking advantage of past experience to include powers to scoop in any stray Electric Lighting Orders, property in which their present owners are not desirous of retaining; and both in the Power Bills and Municipal Bills, permission is being sought to go outside defined districts to supply other authorized purveyors of electricity. This is somewhat forestalling the Supply of Electricity Bill; and it obviates a similar predicament to that in which the Midland Electric Corporation and the Stourbridge District Council now find themselves. Both are authorized undertakers, and one is willing to receive a supply from the other, but may not, according to the Local Government Board, until parliamentary authority is obtained. This question of supply outside authorized areas is one that has been well to the front during the year; echoes of the famous Nine Elms gas case having been heard both at Brighton and Willesden.

Speaking of coming parliamentary events reminds us of the past session, in which there was a very satisfactory victory in connection with the principles first laid down in the Bermondsey clause. Those who initiated the clause, and those who have carried on the campaign in trying to secure its insertion in subsequent Orders and Bills, had no other wish than to have the fair thing done as between the undertakers and ratepayers; and in the Duke of Northumberland's clauses, which recognize the propriety of allowing an incubation period for a new undertaking, we have a very just settlement of the question. But settlement though it is, its application has to be fought for all along the line when the Bills or Provisional Orders Confirmation Bills are before Parliament. The Board of Trade will not take graciously to the clauses—in fact, it is difficult to get them to concede anything that bears the slightest suspicion of being antagonistic to the electrical industry. But the experiences of the past session show that, if municipal electricity supply is to be conducted on a business-like basis, no opportunity must be neglected to secure the application of the clauses. The electrolysis question was kept well alive during the session, but less satisfaction ensued. It is, however, also a matter over which there must be no cessation of activity. The electricians opposing action does not square with their professions. The truth is they pay little heed to the matter of the amount of current that may be passing from their cables; and they are equally untroubled as to the course it takes, or the damage it does in its subterranean wanderings. But they do not want to be saddled with the ultimate destruction arising from cumulative injury. The Supply of Electricity Bill was reintroduced in the past session, and aroused considerable opposition and support as the provisions fitted the fancy or otherwise from all quarters. The Gas Company's Protection Association took part in the fray, and obtained the important exemption of gas lands from the compulsory land purchase powers which the Bill proposes to confer on electricity suppliers. The Bill, it is understood, is to be re-introduced this year; and it is to be hoped that the Committee of the Association will again put themselves among the antagonistic force. There are still important issues for gas companies involved in the measure. The powers which were obtained for the establishment of new undertakings during the session were scattered, to a large extent, among the smaller towns of the country; and the same remark will apply to the promotions for the coming session. The likelihood therefore is that the list of municipal "unproductive" undertakings of the country will, in consequence, be unpleasantly extended, seeing that the rule is for those responsible for promotion to lead the people to expect that electricity will in their little towns be capable of generation and distribution at the price obtaining in larger towns and cities. If the electricians would first teach these people something about their own faith in the potentiality, in regard to costs, of "heavy-load factors," these anxious promoters of municipal adventure would perhaps become a little more cautious. Another question which last session was, and again next session will be, much discussed is that of free wiring.

The year opened badly in respect of accidents. There was the appalling theatre fire at Chicago; and the year has contributed—in all great industries it is so—its share of sorrow through fatal accidents. The Home Secretary has classed electrical machinery in works and factories as "dangerous;" and there is now considerable concern as to the regulations that will be imposed. The year, too, ended badly with the disastrous breakdown at Bradford. In the manufacturing part of the industry, competition and the capacity for over-production resulted in several important balance-sheets presenting anything but agreeable features from the shareholders' point of view.

THE GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 50.)

THE last week of 1904 was one of the best of the year. Naturally it showed the quietude of a holiday season; and the important final settlement engrossed attention, so that the volume of fresh business was reduced, but the bright and buoyant tendency was remarkable. This was especially observable in the gilt-edged department, where everything from Consols downward was on the rise. The key of the position was in the Money Market, which showed its strength by meeting all the heavy demands of the close of the year without any difficulty. Discount was quiet and easy. In the Gas Market, business was hardly up to recent averages, but the advance in prices all round was extraordinary, especially on the last two days of the year. In Gaslight and Coke issues, the ordinary started at 99¾ and finished at 104, the preference marked 109½, and the debenture 86¼. South Metropolitan opened at 130⅜ and closed at 133½. Commercial 4 per cent. was done at 116, and the 3½ per cent. at 113½. The Suburban and Provincial group rose freely, though the transactions marked were few. Brentford preference changed hands at 130, and Brighton ordinary at 167. West Ham ranged from 99½ to 100½. The Continentals were quiet but firm. Imperial opened at 207 and rose to 211. Union ordinary was done at 114 and 116. European fully paid showed transactions at 20⅝ and 20⅞, and the part paid marked 15. Very little business was marked in the remoter undertakings, but many of them scored nice advances. Cape Town was done at 15⅜ and 15¾, River Plate at 11¾ and 11⅞, and Buenos Ayres at 11½. Primitiva preference ranged between 4 15/16 and 4⅞, and the debentures were done at 93⅝.

The closing quotations are shown in our stock and share list.

We append, as usual, a comparative table showing the prices of Gas Stocks and Shares on the last day of the year, and the

corresponding prices of a year ago. In the earlier months of 1904, the market was very dead, and prices persistently continued very low. But in the last quarter, a revival set in, which steadily gained in strength until it culminated at last into a "big boom." Sharp rises always bring after them a certain amount of profit snatching, and a check may succeed the advance; but, for all that, we believe that the general improvement in gas securities has come to stay.

GAS COMPANIES.	Prices on Dec. 31, 1903.	Prices on Dec 31, 1904.	Gain or Loss.
Alliance and Dublin, 10 per cent.	18⅜—19½	20⅜—21½	+2
Do. 7 per cent.	12 —13½	14—15	+1½
Bombay, Limited	5½—6	6—6½	+½
Do. New, £4 paid	4—4½	4¾—5	+½
Brentford, Consolidated	228—233	250—255	+22
Do. New	171—176	190—195	+19
Do. 5 per cent. Preference	130—135	130—135	--
Do. 4 per cent. Debenture Stock	103—1 8	105—108	+1
Brighton and Hove, Original	207—212	227—232	+20
Do. A Ordinary Stock	145—150	167—172	+22
British	38½—39½	40¾—41¾	+2
Bromley, Ordinary 5 per cent. A	115—12	117—122	+2
Do. 3½ per cent. B	88—93	92—96	+3½
Buenos Ayres (New), Limited	1 ¾—10¾	11¾—11¾	+1
Do. 4 per cent. Debenture	91—93	93—95	+2
Cagliari, Limited	22—24	24—26	+2
Cape Town and District, Limited	14—15	15½—16	+1¼
Do. 4½ per cent. Preference	..	9¼—9¾	—
Do. 6 per cent. 1st Mort.	52—54	51—53	—1
Do. 4½ per cent. Deb. Stock	..	100—102	—
Commercial, 4 per cent. Stock	104—107	117—120	+13
Do. 3½ per cent. do.	97—100	113—116	+16
Do. 3 per cent. Debenture Stock	84—87	85—87	+½
Continental Union, Limited	115—120	114—117	—2
Do. 7 per cent. Preference	128—133	140—145	+12
European, Limited	18½—19½	20½—21½	+2
Do. £7 10s. paid	13—14	14—15	+1
Gaslight and Coke, 4 per cent. Ordinary	88—90	103—104	+14½
Do. 3½ per cent. maximum	86—8	92—94	+6
Do. 4 per cent. Con. Pref.	107—110	10 —111	+1½
Do. 3 per cent. Con. Deb.	85—87	86—88	+1
Hastings and St. Leonards, 3½ per cent.	90—95	100—103	+9
Hong Kong and China, Limited	16—17	16—17	..
Imperial Continental	197—200	210—212	+12½
Do. 3½ per cent. Deb. Red.	98—100	96—98	—2
Lea Bridge Ordinary, 5 per cent.	113—118	118—123	+5
Liverpool United A	214—216	219—221	+5
Do. B	163—165	160—162	—3
Do. Deb. Stock	108—110	106—108	—2
Malta and Mediterranean, Limited	4¼—4¾	4—4½	—¼
Metropolitan of Melbourne, 5 p. c. Deb.	101—105	102—104	—
Do. Do. 4½ p. c. Deb.	100—102	100—102	—
Monte Video, Limited	9—10	10—11	+1
Newcastle and Gateshead, Consolidated	105—107	109—110	+3½
Do. 3½ p. c. Deb. Stk.	94—95	90—91	—4
Oriental, Limited	135—140	147—150	+11
Ottoman, Limited	5½—6½	5¼—6¼	—
Plymouth and Stonehouse, 5 per cent.	123—1 8	..	—
Primitiva, Ordinary	..	5¼—5¾	—
Do. 5 per cent. Preference	..	4¾—5¼	—
Do. 4 per cent. Deb. Stock	..	93—95	—
River Plate, Ordinary	10¾—11¼	11¾—12¼	+1
Do. 4 per cent. Deb. Stock	92—94	94—96	+2
San Paulo, Limited	10¾—11¼	12—12½	+1¼
Do. 5 per cent. Deb. Stock	..	53—55	—
Sheffield, A	240—242	238—240	—2
Do. B	240—242	237—239	—3
Do. C	239—241	236—238	—3
Shrewsbury, Ordinary, 5 per cent.	109—112	104½—107½	—4½
South African	..	16—17	—
South Metropolitan, 4 per cent., Ordinary	115—118	132—134	+16½
Do. 3 per cent., Deb. Stk.	86—89	89—91	+2½
South Suburban, Ordinary 5 per cent. Stk.	110—115	123—126	+12
Do. 5 per cent. Preference Stk.	118—123	125—130	+7
Do. 5 per cent. Debenture Stk.	135—138	133—138	—1
Southampton, Ordinary	105—110	105—107	—1½
Do. 4 per cent. Debentures	102—105	..	—
Tottenham and Edmonton, A 5 per cent.	115—120	123—128	+8
Do. B 3½ per cent.	95—100	95—100	—
Do. 4 p.c. Deb. Stk.	..	102—105	—
Tuscan, Limited	8—9	8¾—9¾	+½
Do. 5 per cent. Deb. Red.	98—100	96—98	—2
West Ham, 5 per cent. Ordinary	94—98	100—102	+5
Do. 5 per cent Preference	..	122—127	—
Do. 4 per cent. Debenture Stock	..	101—106	—

With a few unimportant exceptions, it will be seen that the figures indicate substantial rises in values all along the line—a fact which cannot but be gratifying to holders and to those interested in the financial side of gas undertakings. To cope with the ever-advancing strides of the industry, new capital has, of course, been required, not only by many of the Companies mentioned in our list, but also by those carrying on their operations in the London suburbs and the Provinces. Large amounts have been placed on the London Market, principally under the hammer of Mr. Alfred Richards, at his sales at the Tokenhouse Yard Mart periodically throughout the year; and although in the earlier months prices were somewhat more in favour of investors than sellers, yet latterly an appreciably better state of affairs has been manifest, and the capital has been issued at prices indicating a distinctly broadening demand.

Gauging the Discharge of Water-Mains.—An instrument called a "pitometer" is employed in America for gauging the discharge of water-mains; and it has lately been tested at the Ridgewood reservoir of the Brooklyn Water-Works. According to some particulars given in "Engineering Record," the discharge of a 48-inch main was measured by weir readings, and at the same time others were taken on a pitometer by an independent observer. The discharge by weir measurement was found to be 32·765 cubic feet per second, and that by pitometer 32·973 cubic feet. The agreement was within the limits of correctness of weir measurement—showing very clearly the accuracy of the pitometer in the hands of competent observers.

GAS BILLS FOR 1905.

To-day we commence our customary summary of the principal provisions of the Bills relating to gas supply which have been deposited for the next session of Parliament—confining ourselves, in this first notice, to Gas Companies seeking incorporation and statutory powers.

The Andover Lighting and Power Bill is for the incorporation of a Company formed in 1838 under the style of the Andover Gas and Coke Company. The share capital of the Company now consists of £14,000, on which the premiums received amount to £4586 17s. 6d.; while the sums borrowed by the issue of debentures aggregate £11,000. The proposed capital is £63,000, comprising £28,000 original capital, and £35,000 additional capital. New issues may be first offered to consumers and employees. Borrowing powers, in addition to the £11,000 already borrowed, are asked to the amount of one-third of the additional capital. Owners of the original capital will be entitled to two shares for every one share at present held by them. On this capital, the dividend is to be 5 per cent.; while on the additional capital it is to be 7 per cent. A standard price of 4s. 6d. is entered, with half-yearly increases and reductions of dividend by 1s. 3d. per cent. for penny decreases and increases in the price charged for gas. A renewal fund is provided for by contributions not exceeding 1 per cent. per annum on the paid-up capital, until the fund equals one-tenth of the latter. Fourteen-candle power gas is to be prescribed, tested by the Harcourt 10-candle pentane lamp and Sugg's "Wandsworth" 14-candle argand. It is sought to extend the area of supply, and to secure electricity supply powers within the borough. The Company seek to be allowed to grant 10 per cent. discount for prompt payment for both gas and electricity, and to have discretionary powers in the matter of rebates for large consumption. In respect of the electricity concern, after the Company have made provision for all authorized charges, together with a 7 per cent. dividend on the capital employed in the undertaking, they are to make such rateable reduction in the charge as, in their judgment, will reduce the surplus to the maximum rate of profit. Land purchase powers (to the extent of 10 acres) are asked.

The Aylesbury Gas Company were formed in 1861, and are now seeking incorporation. The share capital of the Limited Company consists of £36,000; and there is a balance owing of £2000 of borrowed money. The proposed capital is £100,000, of which £60,000 of consolidated ordinary 5 per cent. stock is to be allotted among the holders of the shares composing the existing capital, and £40,000 is to be additional capital. Permission to borrow up to one third of the latter is desired. A standard price of 4s. 6d. is named; and the sliding-scale is to operate on half-yearly changes in price. By the appropriation of ½ per cent. in each half year, a renewal fund (amounting to one-tenth of the paid-up capital) is to be formed. Sanction is sought to the purchase by agreement of not exceeding 6 acres of land. Authorization to an extension of the limits of supply is wished for. The illuminating power of the gas is put at 14 candles; and the testing-burner is to be Sugg's argand, so constructed as "to develop in its use the full illuminating power of the gas of the quality prescribed by this Act." Permission to grant discounts not exceeding 15 per cent. upon the ordinary price is asked. The Company also desire to be empowered to make application, if they think fit, for an Electric Lighting Order.

In 1898, the Brentwood Gas, Coke, and Light Company were incorporated under the Companies' Acts for the purpose of acquiring the undertaking of the Brentwood Gas and Coke Company; and they are now applying for incorporation with statutory powers. The present capital is £35,000; and the Company have borrowed on mortgage and now owe £10,000. It is proposed to raise the capital to £105,000, of which £35,000 of stock will represent the original capital, and £70,000 the additional capital. Provision is made for consumers and employees having the first offer of new issues. The Company ask for sanction to the borrowing up to £12,000 (including the existing £10,000) on the original capital; and one-third on the additional capital. By appropriations of 1 per cent. annually, a renewal fund equal to 10 per cent. of the paid-up capital is intended to be formed. Power to purchase by agreement an additional 3 acres of land is requested. A standard dividend of 10 per cent. on the original capital, and 7 per cent. on the additional capital is named; and, with a standard price of 4s. 3d., penny changes in price are to carry variations of 5s. and 3s. 6d. on the respective classes of capital. The illuminating power of gas is put at 14 candles; and Sugg's 16-candle argand No. 1—used at such a rate of consumption as will produce a light of 16 candles—is mentioned as the testing-burner, provided that, on the application of the Company, the Board of Trade may approve any other burner.

In the Brockenhurst Gas Company, we have a newly constituted applicant for incorporation and parliamentary powers; the territory which they desire to supply being Brockenhurst, Rinefield, and Sway. A capital of £15,000 is sought, with borrowing powers equal to one-third; but the Company may borrow from time to time £1000 in respect of each portion of capital not exceeding £3000 issued. Beyond the scheduled site for the works, the land purchase proposals by agreement extend to 5 acres. A maximum

price of 5s. is proposed for 14-candle gas, as tested by Sugg's "London" No. 1 argand, "with a 6-in. by 1¾-in. chimney; but if at any time, and so long as, the gas-flame rises above the top of the glass, a 6-in. by 2-in. chimney shall be used, or any other burner or chimney approved for this purpose by the Board of Trade."

Incorporated in 1859, under the Joint-Stock Companies' Acts, the East Cowes Gas Company are now approaching Parliament for incorporation and powers. Of the existing authorized capital, £11,000 has been issued. It is proposed that the total authorized capital shall be £30,000, of which £12,000 is to be known as the original capital. The total capital, it is intended, shall bear one-third borrowing powers. The maximum dividends are to be 10 and 7 per cent. In defining the limits of supply, the Company include a portion of the parish of Whippingham, forming part of the supply district of the Newport Gas Company, who, however, have not yet commenced to furnish gas to it. A renewal fund is desired, to be accumulated by annual additions not exceeding ½ per cent. on the paid-up capital, until the fund is equal to one-tenth of the latter. Provision is to be made for the appointment of Auditors who are members of the Institute of Chartered Accountants or the Incorporated Society of Accountants and Auditors. Six acres is the extent of land for which power to purchase by agreement is sought. The price of gas is not to exceed 5s.; and the illuminating power is to be 14 candles. The testing-burner is merely described as of the type known as Sugg's argand, constructed to develop in its use the full illuminating power of gas of the quality prescribed. The Company propose limiting themselves to a total of 15 per cent. by way of discounts. The Directors also ask for power to determine the salary of the Secretary.

The Epping Gas Company, Limited, started in 1862; and the share capital is at present £10,000. The Company are now approaching Parliament seeking incorporation, and asking that their limits may be defined as including Epping and several other parishes in the county of Essex. The capital it is sought to increase to £40,000. It is intended that the present holders shall receive two shares for every one. This will absorb £20,000; and leave £20,000 additional capital. On the original capital the Company ask for power to borrow £3333, and one-third on the additional capital. The standard rate of dividend is to be 5 per cent. The proposed standard price for gas is put at 4s. 3d. per 1000 cubic feet within a radius of three miles of the gas-works, and 4s. 6d. beyond; and the sliding-scale is to be arranged on the half-yearly basis. The illuminating power specified is 14 candles, tested by Sugg's argand burner for gas of such illuminating power, or any other burner or chimney approved by the Board of Trade. The Company wish to be allowed to grant discount up to 15 per cent. for prompt payment, and rebates to large consumers upon such scale as may be considered desirable. Authorization to purchase land by agreement, up to 5 acres, is desired.

The registration of the Great Berkhampstead Gaslight and Coke Company took place in 1849; and seven years later the Company were incorporated under the Joint-Stock Companies' Act of 1856. In 1888 they obtained a Provisional Order; and now desire to be incorporated with parliamentary powers. The present share capital consists of £9300; and in respect of 460 £5 shares the Company have received premiums amounting to £1130 6s. 6d. By means of debenture bonds they have borrowed £1500. Additional capital to the amount of £42,000 is sought, making the total £51,300, with one-third borrowing powers. The dividends on the present capital are at the rates of 10 and 7 per cent.; and 7 per cent. is also proposed in the Bill for such part of the additional capital as is raised by way of ordinary shares. The standard price of gas is placed at 4s. 7d.; and the sliding-scale is to operate annually or half-yearly as the case may be. The usual powers as to reserves are inserted, including a renewal fund up to one-tenth of the paid-up capital, to be accumulated by not exceeding ½ per cent. appropriations in each year or half year. The Auditors are to be members of the Institute of Chartered Accountants or the Incorporated Society of Accountants and Auditors. The site of the existing works is situated in proximity to the Great Berkhampstead Grammar School, for the extension of which the gas-works site is now required. An agreement has already been effected between the parties for the sale, subject to the Bill receiving the Royal Assent. The Company therefore ask to be authorized to acquire new lands to which to remove their works. Power is sought to purchase 10 acres by agreement. The Bill embraces clauses for the protection of the London and North-Western Railway Company and the Grand Junction Canal Company. The proposed illuminating power of the gas is 14 candles; and Sugg's "Wandsworth" argand is named as the testing-burner. Regarding discounts to large consumers, 20 per cent. is entered as the limit. Authorization is sought to an application, if thought fit, for a Provisional Order to supply electrical energy, and to the determination by the Directors of the salary of the Secretary.

The Hessle Gas Company were formed in 1861. By a special resolution passed in March last, it was resolved that the provisions of the Memorandum of Association should be altered by adding to its objects various other matters connected with the business usually carried on by gas companies and also the supply of electricity. The resolution was confirmed by an order of the Chancery Division of the High Court in June; and the Company are carrying on their business in pursuance of the altered Memorandum of Association. The Company now seek incorporation and parliamentary powers. A capital of £30,000 is proposed, consisting of £15,135 of stock, representing the capital of the existing Company, and £14,865 additional capital. It is provided that the whole or any part of the additional capital may be converted into stock when fully paid. The standard rates of dividend are to be 10 and 7 per cent. Permission is asked to the borrowing of £5000 on the original capital, and one-third on the additional capital. The standard price suggested for gas within the district of Hessle and the parish of Anlaby is 3s. 6d., and within the parishes of Willerby and Kirk Ella 4s.; and the sliding-scale is applied to the dividends on the yearly basis. By annual allocations from revenue—not exceeding 1 per cent. on the paid-up capital—the Company may form a renewal fund equal to 10 per cent. on the capital. Power to purchase not exceeding 3 acres of land is sought. Regarding prepayment meter supplies, the following clause appears: "Any moneys placed in a prepayment meter shall not be deemed to be paid to the Company until such moneys have been actually received by the Company." The quality of the gas is to be 14 candles, tested by a Sugg No. 1 "London" argand. A 20 per cent. limit is placed on discounts to consumers in consideration of prompt payment or of large consumption. The Company desire power to apply, if thought fit, for a Provisional Order to supply electric energy.

The Hitchin Gas Company, Limited, were originally formed in 1834; and they now wish to be incorporated, with parliamentary powers. The present share capital is £7000; and the Company have borrowed £14,000. The limits of supply are to be defined. The capital proposed is £50,000 of consolidated ordinary stock, bearing a dividend of 5 per cent. Of this, £14,000 is to represent the original capital, and £36,000 the additional capital. Inclusive of the £14,000 already borrowed, the Company ask for borrowing powers to the extent of one-third. For the purposes of the undertaking, the Company desire to be empowered to purchase by agreement any lands not exceeding 5 acres. In Hitchin, the standard price proposed to be charged for gas is 4s.; and in the remaining portion of the limits, 4s. 6d. The sliding-scale is to apply half-yearly; and the rise and descent of the dividend, it is proposed, shall be 2s. 6d. for each penny reduction or increase in the price of gas. In regard to prepayment meters and fittings, the Company ask for an excess of 10d., and a charge of 1d. for any less quantity than 100 cubic feet. For a prepayment meter without fittings, 10 per cent. on the cost is desired. This is the first Bill yet noticed which proposes an illuminating power of 15 candles, tested by a Sugg No 1 "London" argand. A limit of 20 per cent. is suggested for discounts.

With the object of supplying gas to the parishes of Billingshurst, Wisborough Green, Slinfold, and Kirdford, the North Sussex Gas Company seek to be incorporated, and to have parliamentary powers conferred upon them. The amount of capital the promoters desire to be authorized is £12,000, together with borrowing powers to the extent of £4000. A piece of land in the parish of Billingshurst is scheduled for the works; and, in addition, the Company ask for power to purchase by agreement any lands not exceeding in the whole 5 acres. The maximum price of gas is placed at 5s. per 1000 cubic feet of 14-candle power. For testing purposes, Sugg's No. 1 "London" argand burner is named.

The Seaham Gas and Lighting Company were incorporated in 1897 under the Companies' Acts to take over, as a going concern, the undertaking of the Seaham Harbour Gas Company, Limited. In the Bill now deposited, the Company ask to be dissolved and reincorporated, with statutory powers. The capital of the Company is £30,000; but on 300 of the shares there is yet £12 10s. to be called up. The Company have also borrowed £8000. The proposed capital is £50,000, of which £20,000 is additional. It is intended that of the original capital, £15,000 shall consist of £15,000 of ordinary "A" stock, entitled to a dividend of 10 per cent; £7500 divided into 300 ordinary shares of £25 each, on which £12 10s. has been paid, and entitled to a dividend of 10 per cent. (when converted these shares will be known as "B" stock); and £7500 preference stock with a dividend of 5 per cent. The additional capital will consist of ordinary shares or stock, entitled to a dividend of 7 per cent. per annum. Including the sum already borrowed, the Company desire on the original capital to borrow not exceeding, in the whole, £10,000, and one-third on the additional capital. The promoters also seek power to purchase by agreement the existing gas lands and other scheduled ground; and beyond this, also by agreement, any other lands required not exceeding 3 acres. The maximum price of gas is put at 3s. 8d. per 1000 cubic feet for 14-candle gas, tested by Sugg's No. 1 "London" argand. Respecting prepayment meter supplies, the Company ask to be authorized to charge 10d. extra for meter and fittings; 1s. for meter, fittings, and cooker; and 6d. for meter alone. Discounts are suggested at a maximum rate of 10 per cent. for prompt payment and 15 per cent. for large consumers.

The Thames Valley and Goring Water and Gas Company, Limited, have been working under Provisional Orders obtained in 1888, 1902, and 1903; and they now seek to be dissolved and reincorporated, with extended powers, under the title of the South Oxfordshire Water and Gas Company. The water clauses of the Bill (which are the more important) will in due course be dealt with among the notices of the water measures. The limits of gas supply are the parish of Streatley in the county of Berks, and

the parish of Goring in the county of Oxford. For the purposes of the gas undertaking, the proposed capital is only £18,000, whereof the sums of £8000 and £100, bearing respectively 10 and 7 per cent. maximum dividends, are to be known as the original capital and £9900 as the additional capital. The capital is to carry one-third borrowing powers. The standard rates of dividend are to be 10 and 7 per cent.; and the standard price of gas 5s. per 1000 cubic feet. The sliding-scale, on the yearly terms, is applied. The Company desire to have the power to allow discounts to consumers equal to 10 per cent. for prompt payment and 15 per cent. for large consumption. The proposed illuminating power of the gas is to be 14 candles, with Sugg's No. 1 "London" argand as the testing-burner. The accounts of the two undertakings are to be separately kept. In addition to the lands now held by them, the Company ask for authority to purchase by agreement, for the general purposes of both undertakings, lands not exceeding in the whole 10 acres.

THE CHECK TO TRADE UNIONISM.

From the official returns compiled by the Labour Department of the Board of Trade, it appears that the check to the progress of trades unionism, which has been noticeable the past few years, became still more marked in 1903. In that year, the number of members of Trades Unions in this country fell from 1,925,000 to 1,902,000—a decrease of 1·2 per cent., and a total loss of membership from the high-water mark of the year 1901 of 1·9 per cent. The Labour Department's explanation of this decline is that trade is bad. Trade Unions have their lean years and their fat years. When wages are high and employment is regular, no difficulty is experienced in paying the Union levies; but when the tendency is in the other direction, with wages going down and the number of unemployed increasing, subscriptions get in arrears, and members drop out of benefit. This, no doubt, applies more particularly to the case of Unions which make no provision for the relief of members temporarily out of work. "Unemployed benefit," we are told, "is a form of insurance against unemployment much practised by the older Trades Unions." In times like those we are now passing through, the members must find it one of the most satisfactory features of their connection with such organizations. What the younger societies offer in place of this insurance against want of work, the Labour Department does not tell us. Unions which are formed on an aggressive basis—whose principal mission is to fight capital—naturally have little money to spare for men who are out of work merely because trade is slack; and it is in these organizations we suspect that the greatest falling off in numbers is to be found.

Apart from this question of mere numbers, there is some interesting information in the return. One remarkable fact is that, although the membership of Trades Unions as a whole is declining, the funds of the principal unions show a steady increase. In dealing with the finances of Trades Unionism, the Labour Department selects the 100 principal Societies for comparison. These had a membership in 1903 of 1,133,640; and they possessed funds amounting to £4,550,775. The most remarkable factor in this connection is that, while in ten years the membership has increased by only 230,877, the sum of £1,976,831 has been added to the accumulated funds. In 1902, the Societies had to their credit sums equal to an average of £1 14s. 10½d.; while in 1903 the average was £4 0s. 5½d. The increase in the accumulated funds has been specially marked in recent years. Two millions have been added to the savings of Trades Unions since the engineers' great strike in 1897; and though trades unionism has received more than one notable set-back in the interval, there is no doubt that the financial position of the principal Societies has greatly improved. To some extent this is due to the fact that there has been a smaller expenditure on strikes. Looking back over the decade, three years stand out conspicuously as regards the cost of trade disputes. These are 1897, when £659,079 was spent under this head; 1893, when the amount was £574,208; and 1892, when it was £398,035. In 1903 the expenditure under this head was only £172,418, or 9·1 per cent. of the total expenditure, a lower percentage than in any other year of the decade. It is pointed out that this decrease was mainly due to the fact that there were fewer labour disputes in the coal-mining industry than in former years.

The return shows that in the past ten years about 18 per cent. of the expenditure of the Unions was for "dispute benefits;" while 22·3 per cent. went in support of unemployed members, and 39·3 per cent. was paid in cases of sickness, accidents, and death. The balance of 20·4 per cent. is accounted for by the working expenses. Thus over 60 per cent. of the funds of the principal Unions is devoted to other purposes than the maintenance of disputes, which is a strong point in favour of the division of the funds (as suggested by Sir George Livesey) so as to separate those used for benefit purposes from campaigning funds which go to maintain strikes.

Mr. Thomas F. Lane, the Manager of the Monte Video Gas-Works, who has been for some months in England on leave of absence, left for Brazil last Friday to take up his work again in connection with the Company.

PUBLIC LIGHTING SQUABBLE IN NEW YORK.

In copies of the "New York American" which have just reached us, considerable space is occupied with the subject of the last contract entered into with the United Gas and Electric Light Companies—referred to collectively as the Gas Trust—for the public lighting of the city. Judging by the extent to which prominent head-lines—those valuable resources of American (and also of not a few English) journalists—are employed by our contemporary, the placing of this contract is a matter only second in importance to the presidential election. Last month there was reproduced in the "Journal" a sensational story sent to the "Daily Express" by the New York Correspondent of that paper, to the effect that 300 deaths had been caused in the east side tenement districts of the city by the gas supplied to them, and that 21 deaths had occurred the preceding week. At a first glance, one would have supposed that the terrible disaster first referred to had recently occurred, and that the minor one had followed closely upon it. It appears, however, that this record of fatalities was cited in the course of some comments by the "New York American" on a letter which had been addressed to the Hon. John J. Delany, the Counsel to the New York Corporation, by Mr. J. T. Oakley, the Commissioner of the Water Supply, Gas, and Electricity Department. The learned Counsel had, it would seem, written to the Commissioner on the subject of the quality of the gas supplied to the city, and asked for some "standard of purity" to be set up; and Mr. Oakley had replied that this could not be done without fresh legislation. The clause in the contract with the city specifies simply that the gas shall be clean, and of such quality that it will not deteriorate the mantles in incandescent lamps, so as to shorten their life; and also that it shall be entirely free, within limits not injurious to the public health, from ammonia, sulphuretted hydrogen, and other sulphur or noxious compounds. Mr. Oakley reminded his correspondent that the gas furnished to the city is tested by the Chemist of the department (Dr. E. G. Love) for both illuminating power and purity, and a report is made by him monthly and quarterly. He forwarded copies of the reports for the years 1902 to 1904, and pointed out that no particular changes had been shown as having occurred in the qualities and kinds of gas which had been furnished to the city. A further comparison of the published reports of the department for the years prior to 1901 also failed to reveal any radical change.

The foregoing correspondence accounts for the sudden appearance of the sensational story about the 300 deaths, and it bears to this extent upon the public lighting question—that Mr. Oakley is accused of using his position to favour the Gas Trust. Divested of all sensationalism, the "bottom facts," as our American cousins would say, may be stated very shortly. Mr. Oakley's predecessor in office—Commissioner Monroe—held the opinion that the charge for gas was too high. The Trust wanted $146 a year for a 2000-candle power lamp; and he declared that the average charge for such lights in all cities was $85 only. Thereupon a dispute arose between him and the Trust—the latter claiming $6,000,000 for two years' lighting, and the Commissioner asserting that they were not entitled to more than $4,000,000, and declining to pay a cent until his figures were accepted. He dared the Trust to sue for their money in the Courts; but, doubtless for good and sufficient reasons best known to themselves, they persistently declined to do so. The consequence was that for two years the lighting bills for the city remained unpaid. Then came a change, and Mr. Monroe was succeeded by a more complacent Commissioner, who selected a time when public attention was concentrated upon a great national event to get the gas bills difficulty removed. Towards the end of October, when the presidential election was in progress, he entered into a contract with the Trust for one year's city lighting for $3,000,000, and practically confirmed their preceding contracts; thereby substantiating their claim to the $6,000,000 which had been so persistently resisted by Commissioner Monroe. Under the new arrangement, the charge will be $140 instead of $146 per lamp. It is this new contract that has aroused the "New York American," and prompted it to lay before the citizens of New York the facts in regard to this matter in language which, so far as the Trust and certain municipal officials are concerned, cannot be characterized as moderate.

It certainly seems strange that the Gas Commissioner should have the power to conclude a contract of this kind on his own responsibility. But the Mayor (Mr. M'Clellan) says that his action was perfectly regular. The features of the main contract were approved by the Board of Estimate and Apportionment; and consequently, according to the Mayor, it was within the scope of the Commissioner's authority to execute the subsidiary contracts. As these will, it is understood, furnish the city with better light than it has hitherto had, and at a lower figure, his Worship considers that the Commissioner has done very well. Needless to say, our contemporary does not share this view. It roundly charges the Mayor and the Commissioner with "betraying the people in permitting them to be robbed"—the accusation of robbery being, of course, based on the assumption that the charge which the former Commissioner refused to pay was not a just one. There are, however, two sides to this question as to every other. It must be acknowledged that, on the case presented so forcibly by the "New York American," there was what looks uncommonly like a little playing into the hands of the Trust; and the cry is

not unnaturally raised for municipal ownership of the lighting plant. It is asserted that every time there is a transaction between a municipality and a private company, "the people are always in danger of getting the worst of it." This may be the case on the other side of the Atlantic; but we should not like to say that they always come off best when they have to deal with a municipality. Whether or not the parties to the present transaction deserve all the hard things said of them, we will leave our readers to judge from the facts here presented.

NAPHTHALENE FREEDOM AT LEICESTER.

A MORE severe test could not be wanting than has been afforded by the atmospheric conditions of the last month or two of the efficacy of the solvent Mr. Colson is using at Leicester for the washing at one works and the spraying at the other of the gas produced for relieving him, his staff, and the gas consumers of the vexation and worry occasioned by naphthalene deposition.

Complete figures of the past month's experiences have been furnished by Mr. Colson; and this completes the records up to the present time since the use of the solvent commenced. The first table shows the number of naphthalene cases in the supply district during the month; and the second one the quantity of gas made and treated since the last return. The figures in the first table are remarkable for two reasons. In the first place, the naphthalene cases with which the department had to deal during the month only amounted to six (and all occurred in the district supplied from the old works), as compared with the formidable-looking sum of 2509 cases for the corresponding period of 1903, with a day's maximum of 239. Truly, the saving realized, as between 2509 cases of stoppage of gas supply and only 6, can hardly be appraised in money value alone. The second noticeable point is the gradually improving effect that the spraying since Oct. 22 of the gas from the Belgrave Gate works (until such times as washing can be resorted to there as at Aylestone Road) has had upon the returns. The former return (see "JOURNAL" for Dec. 6) presented a falling off in the number of cases; and the table now published shows that, of the total of six cases, four occurred in the early part of the month—all being in the Belgrave Gate works district—and that since Dec. 3 there have only been two isolated cases. Throughout this winter, too, carbonization has been proceeding at high temperatures, with a high yield of gas per ton and per mouthpiece; whereas during the corresponding month of last year, the temperatures were kept well under control. The manner of treating the gas with the solvent at the Aylestone Road works remains the same; the full quantity of the gas made having been washed. At the Belgrave Gate works, the washing apparatus not having yet been delivered, the gas (as already intimated) has continued to be treated with the spray or mist as described last month. There is no question about the efficiency of this method of treatment, although Leicester experience does not vote it quite so convenient as washing. In the spring, a washer will be installed; but, in the meantime there will be entire reliance on the spray. Another point to which attention should be drawn is that the water-gas plant was brought into temporary use to help the department to tide over the heavy demand just preceding Christmas; but less than a million cubic feet was made. The plant was only started on the Friday evening before Christmas, when 279,000 cubic feet of gas was produced; the remaining quantity being made on the following day. In December last year, when there was the heavy trouble with naphthalene already referred to, the quantity of carburetted water gas produced was 8,216,000 cubic feet, or 5·69 per cent. of the gas made at Aylestone Road. The present freedom from naphthalene complaints cannot therefore be attributed to the use of carburetted water gas. Mr. Colson (who is to be congratulated upon the relief he has secured and is enjoying) is convinced, by the experience since last May, that, so far as Leicester is concerned, the naphthalene difficulty is as dead as Queen Anne.

NAPHTHALENE COMPLAINTS.

	1904.	1903.		1904.	1903.
December 1	3 B	121	December 18	0	97
,, 2	1 B	143	,, 19	0	61
,, 3	0	108	,, 20	1 B	0
,, 4	0	186	,, 21	0	96
,, 5	0	143	,, 22	0	87
,, 6	0	0	,, 23	0	32
,, 7	0	239	,, 24	0	52
,, 8	0	189	,, 25	0	2
,, 9	0	131	,, 26	0	4
,, 10	0	99	,, 27	0	0
,, 11	0	135	,, 28	1 B	20
,, 12	0	69	,, 29	0	51
,, 13	0	0	,, 30	0	62
,, 14	0	129	,, 31	0	49
,, 15	0	71			
,, 16	0	74		6 B	2,509
,, 17	0	59			

"B"—Gas from Belgrave Gate works.

NAPHTHALENE TREATMENT.

1904. Week ending	Aylestone Road. Coal Gas Made. Cubic Feet.	Coal Gas Treated. Cubic Feet.	Coal Gas Untreated. Cubic Feet.	Percentage of Coal Gas Treated.	Water Gas Made. Cubic Feet.	Total Coal and Water Gas.	Percentage of Water Gas.	Belgrave Gate. Coal Gas Made. Cubic Feet.	Coal Gas Treated with Spray of Solvent.	Percentage of Coal Gas Treated.	Total Coal Gas Made at both Works.	Total Coal and Water Gas Made at both Works.	Total Gas Treated at both Works.	Percentage of Gas Treated at both Works.
Dec. 1	38,059,000	38,059,000	*nil*	100·00	*nil*	38,059,000	—	16,601,000	16,601,000	100·00	54,660,000	54,660,000	54,660,000	100·00
,, 8	33,218,000	33,218,000	*nil*	100·00	*nil*	33,218,000	—	16,079,000	16,079,000	100·00	49,297,000	49,297,000	49,297,000	100·00
,, 15	37,730,000	31,730,000	6,000,000	84·09	*nil*	37,730,000	—	16,523,000	16,523,000	100·00	54,253,000	54,253,000	48,253,000	88·94
,, 22	35,037,000	35,037,000	*nil*	100·00	*nil*	35,037,000	—	15,951,000	15,951,000	100·00	50,988,000	50,988,000	50,988,000	100·00
,, 29	35,013,000	35,013,000	*nil*	100·00	953,000	35,966,000	2·65	16,597,000	16,597,000	100·00	51,610,000	52,563,000	51,610,000	98·18
Total	179,057,000	173,057,000	6,000,000	96·65	953,000	180,010,000	0·53	81,751,000	81,751,000	100·00	260,808,000	261,761,000	254,808,000	97·34
Corresponding period of last Year	153,190,000	—	153,190,000	—	8,740,000	161,930,000	5·39	88,296,000	—	—	241 486,000	250,226,000	—	—

THE FOG AND LARGE GAS CONSUMPTION.

WIDESPREAD interest has been taken in the figures published in the "JOURNAL" last Tuesday relating to the consumption of gas during the terribly black and foul fogs of the previous week. The figures for the most part referred to those concerns where winter days' makes are spoken of in two and three figures of millions; and to-day it will not be amiss to drop down the scale somewhat, to see what effect the worst atmospherical conditions of the week had upon the demand for gas principally in London suburbs. Before giving the figures, however, we have to supplement those supplied in last week's issue.

Commercial Gas Company.—The Chief Engineer (Mr. Stanley H. Jones) says the total quantity of gas supplied from the Company's works from Dec. 1 to Dec. 24 inclusive was 298,004,000 cubic feet; and in the same period of 1903, 287,926,000 cubic feet. From Dec. 21 to 24 inclusive, the figures were 54,988,000 cubic feet; and in 1903, 52,608,000 cubic feet.

Glasgow.—In addition to the figures referring to the supply in Glasgow as published last week, it is interesting to learn from Mr. Alex. Wilson that on the Friday preceding Christmas the Department made their record output. The quantity registered that day was 37,135,000 cubic feet, as compared with 35,065,000 cubic feet on the corresponding day of 1903.

Newcastle-on-Tyne.—In the transmission of the figures from Newcastle published last week, the Post Office made an error in one figure, which, as it represented a million cubic feet, had an important effect on the consumption, and was the cause of the inference that there had been a reduction. The send-out on the Thursday should have been stated as 14,163,000 cubic feet, as against 13,895,000 cubic feet on the corresponding day of 1903. It will thus be seen that there was an increase, and not a decrease as the mistake in the telegraphic message led us to suppose.

Taking next the experiences in the suburbs, we have first to notice the

Croydon Gas Company.—In reply to our inquiry, Mr. J. W. Helps sends us the particulars of the consumption in Croydon and the district on Christmas Day and the six preceding days, which he regards as affording a fairer comparison than taking the week ending Dec. 24 of last year and the corresponding week of 1903.

	1904. Cubic Feet.	1903. Cubic Feet.	Increase. Cubic Feet.	Increase. Per Cent.
1	4,108,000	3,996,000	112,000	2·8
2	4,168,000	3,405,000	763,000	22·4
3	4,655,000	3,914,000	741,000	18·9
4	4,774,000	3,829,000	945,000	24·6
5	4,902,000*	4,027,000	875,000	21·7
6	4,653,000	4,377,000	276,000	6·3
Christmas Day	3,953,000	3,755,000	198,000	5·2
	31,213,000	27,303,000	3,910,000	14·3

* The record day's consumption for 1903 was 4,402,000 cubic feet.

Fletcher, Russell & Co.

MANUFACTURERS OF **Limited.**

GAS FIRES.

"REGISTER" GAS FIRES
TUBULAR STOVES
REFLECTOR STOVES
CHANCEL STOVES
GREENHOUSE BOILERS

GAS COOKING RANGES.

LARGE OVENS
CONFECTIONERS' OVENS
CARVING TABLES
HOT PLATES
GRILLERS
COOKING UTENSILS
RAPID WATER HEATERS
SMOOTHING IRONS
&c., &c.

Show-Rooms { 134, QUEEN VICTORIA STREET, LONDON, E.C.
130 & 132 DEANSGATE MANCHESTER.

WARRINGTON, MANCHESTER, AND LONDON.

WILLIAM SUGG'S PATENT

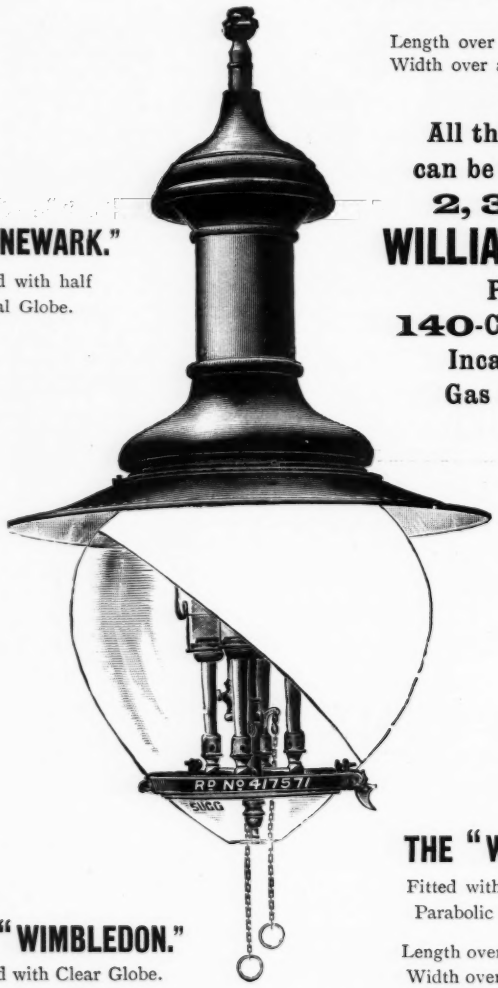
LAMPS FOR SHOP LIGHTING.

Specially designed for use with Incandescent Gas Burners, and are the Best and Cheapest Lamps on the Market.

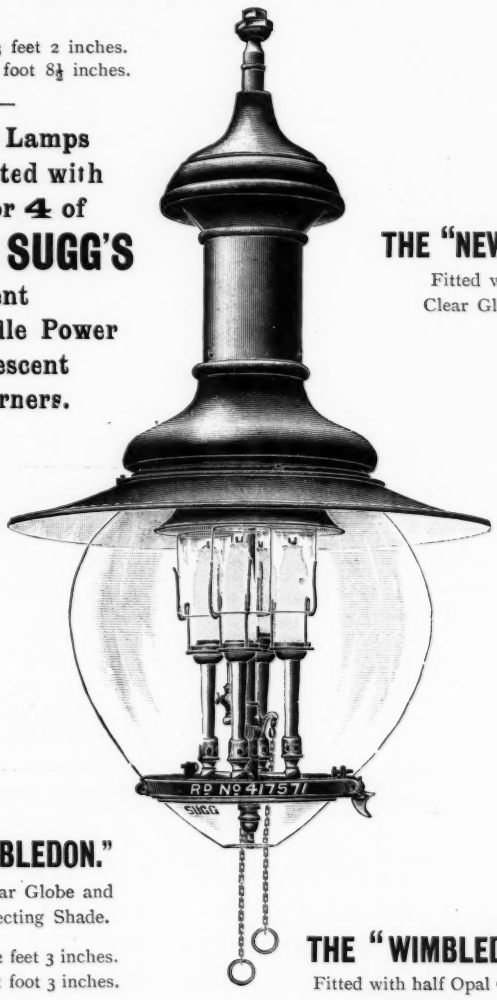
Length over all 3 feet 2 inches.
Width over all 1 foot 8½ inches.

All these Lamps can be Fitted with 2, 3, or 4 of WILLIAM SUGG'S Patent 140-Candle Power Incandescent Gas Burners.

THE "NEWARK."
Fitted with half Opal Globe.



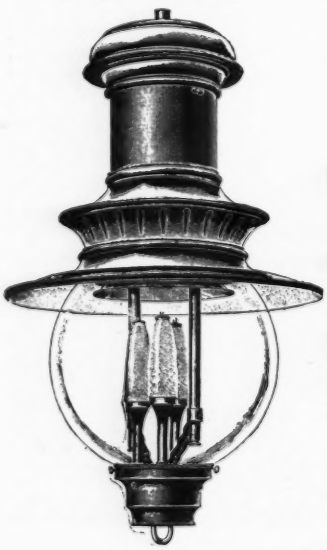
THE "NEWARK."
Fitted with Clear Globe.



THE "WIMBLEDON."
Fitted with Clear Globe and Parabolic Reflecting Shade.

Length over all 2 feet 3 inches.
Width over all 1 foot 3 inches.

THE "WIMBLEDON."
Fitted with Clear Globe.



Can also be supplied with Opaline Globe.

560-Candle Power for 20 feet of Gas per hour.

THE "WIMBLEDON."
Fitted with half Opal Globe.

PLEASE WRITE FOR LIST No. 11.

WILLIAM SUGG & Co., LIMITED. ENGINEERS, VINCENT WORKS, WESTMINSTER, S.W.

Lea Bridge.—In this Company's district, we learn from Mr. F. W. Cross, the dense black fog continued right through Thursday until midday Friday; and as stock was steadily being lost until then, he confesses to having felt some anxiety. From Dec. 21 to 24, 1904, inclusive, the consumption was 4,788,300 cubic feet; Dec. 21 to 24, 1903, 3,971,200 cubic feet. The increase was therefore 20·5 per cent. The maximum day's output was 1,307,100 cubic feet; and in 1903, 1,063,400 cubic feet—an increase of 22·9 per cent. At no time during the heavy draught on the mains was it found necessary to reduce the pressure.

Mitcham and Wimbledon.—Mr. Benjamin Green informs us that the highest output his Company have ever attained was on the 22nd ult. Taking the two foggy days of the week, on Dec. 21 the consumption was 1,615,300 cubic feet, and on the corresponding day of 1903 1,315,800 cubic feet; so that the increase was 299,500 cubic feet. On Dec. 22, the consumption was 1,686,100 cubic feet, as compared with 1,332,900 cubic feet; so that the increase was 353,200 cubic feet.

North Middlesex.—Mr. L. Trewby writes that, in the case of his Company, the advance in consumption during the recent foggy weather was in no way exceptional. They "only had a 10 per increase, which is the usual figure."

South Suburban.—The South Suburban Company had no difficulty whatever in meeting the demands upon them during the foggy weather; and all through black week, the pressure was maintained at a higher point than at any time previously. Mr. S. Y. Shoubridge supplies us with figures showing a good increase for both days, particularly the 22nd ult. The quantity of gas sent out on Dec. 21 was 6,417,000 cubic feet, which compares with 5,723,000 cubic feet on the corresponding day of 1903. On Dec. 22, the output was 6,772,000 cubic feet, which compares with 5,855,000 cubic feet in 1903.

Tottenham and Edmonton.—Mr. A. E. Broadberry is generous. In response to the inquiry as to the consumption in the Tottenham and Edmonton Company's district during the recent foggy days, he sends us his complete record of the daily output for the month. The district of the Company is composed largely of a middle and working class population; and, as the climatic conditions of the month were exceedingly variable and are fresh in the memory, it may interest some readers to have the complete figures:—

	Cubic Feet.		Cubic Feet.
Dec. 1	3,923,000	Dec. 17	4,636,000
,, 2	4,017,000	,, 18	2,914,000
,, 3	4,331,000	,, 19	4,168,000
,, 4	3,140,000	,, 20	4,488,000
,, 5	4,136,000	,, 21	4,337,000
,, 6	4,469,000	,, 22	5,078,000
,, 7	4,329,000	,, 23	5,242,900
,, 8	4,123,000	,, 24	5,202,000
,, 9	4,333,000	,, 25	3,755,000
,, 10	4,655,000	,, 26	3,632,000
,, 11	3,077,000	,, 27	3,623,000
,, 12	4,341,000	,, 28	3,741,000
,, 13	4,298,000	,, 29	3,689,000
,, 14	4,263,000	,, 30	4,050,000
,, 15	4,170,000	,, 31	4,332,000
,, 16	4,191,000	Total	128,683,000

In December of 1903, the total output was 111,804,000 cubic feet; so that the increase last month in comparison with that month was 16,879,000 cubic feet.

Wandsworth and Putney.—Mr. H. O. Carr supplies us with the following comparison for the week ending Dec. 24, from which it will be seen that on the Saturday the Company made their highest delivery; and it marks the record in the Company's history. For the week, they had an increase of 2,083,000 cubic feet.

	1904. Cubic Feet.		1903. Cubic Feet.
1	2,911,000	..	3,059,000
2	3,868,000	..	3,700,000
3	3,714,000	..	3,599,000
4	4,205,000	..	4,114,000
5	4,003,000	..	4,095,000
6	4,101,000	..	3,574,000
7	4,498,000	..	3,076,000
	27,300,000		25,217,000

West Ham.—In view of the wide publication of an announcement that the gas supply of one of the Companies on the east-side of London failed during the days of densest fog, we are glad to have the opportunity of announcing that the statement does not apply to the West Ham Gas Company, for Mr. John Clark informs us that the Company had no difficulty whatever in maintaining full pressures the whole time. The figures sent show striking increases for the 22nd and 23rd of December.

	1904. Cubic Feet.		1903. Cubic Feet.		Increase Per Cent.
Dec. 21	6,214,000	..	5,555,400	..	11·85
,, 22	7,699,000	..	5,540,900	..	38·94
,, 23	7,349,000	..	5,852,900	..	25·56
,, 24	6,754,000	..	6,004,700	..	12·47
	28,016,000		22,953,900	..	22·05

Manchester.—When the fog came on at Manchester, the Gas Committee were caught at a disadvantage, for which, the "Manchester Guardian" says, the City Council as a whole is really responsible. If the Council had not interfered with the Committee's action, the alterations and improvements now being made at the Gaythorn works would have been completed three months ago; and this, as stated by Mr. Nickson in an interview which is noticed in another column, would have increased the producing capacity by 3 million cubic feet per day. In spite, however, of the fact that the fog was the thickest and longest on record, it was not until the fourth day that the Committee found themselves unable to maintain a full supply of gas. On Thursday night, the 22nd ult., it was noticed that the big modern gas-lamps which contain clusters of four incandescent burners had only one little flickering flame in them. The same process had to be gone through on the following evening; and consequently, wherever gas was the sole illuminant, the city was in a state of profound gloom. Some idea of how the Gas Committee was pressed, may, says our contemporary, be gathered from the following figures, which show the amount of gas consumed during the four days from the 19th to the 22nd ult., and in the corresponding week of 1903:—

	1904. Cubic Feet.		1903. Cubic Feet.
Monday	24,369,000	..	21,436,000
Tuesday	25,677,000	..	22,824,000
Wednesday	26,819,000	..	23,613,000
Thursday	25,557,000	..	22,546,000

Wednesday's consumption, as was stated in last week's "JOURNAL," constituted a record; the previous one having been established in 1899. The stock of gas on the Friday morning was only 4,550,000 cubic feet; and by ten o'clock this had fallen to 4,220,000 feet. At noon, the position was even worse, for the stock was only 3,500,000 feet. The process of declension was not even then stayed, for at four o'clock in the afternoon there was only 2,013,000 cubic feet in the holders. Those persons seem to have suffered most who depended on gas for cooking, and several restaurants are said to have been put to great inconvenience. On the Saturday, however, the full supply was again resumed. The following table, taken from the "Manchester Guardian" for the 29th ult., shows the consumption of gas during Christmas week (when Christmas Day was on a Sunday) in the years 1887, 1892, 1898, and 1904:—

Year.	Number of Consumers.	Week's Consumption. Cubic Feet.	Christmas Day Consumption. Cubic Feet.	State of Weather.
1887	77,400	103,375,000	8,576,000	One foggy day. Rest of week fine or dull.
1892	81,443	115,736,000	9,575,000	Four days dull and very mild. Three days frost.
1898	116,689	138,670,000	11,614,000	Three days bright. One dark all day. Three days dull.
1904	150,734	160,578,000	14,439,000	Five cold and very foggy days.

The Christmas Day consumption this year compares with 13,041,000 cubic feet last year, when Christmas Day was on Friday.

Elland.—As will be seen from the following extract taken from the "Halifax Courier" dated the 24th ult., a record consumption of gas took place at Elland: "It is a long time since we experienced such a foggy period as has been the case this week. Consequently, nobody will be surprised to learn that during the last six days the consumption of gas has established a record. Never in the history of the Elland-cum-Greetland Gas Company has so much gas been consumed in so short a time; and it is fortunate that the Company are the possessors of an up-to-date plant to meet all the demands which may be made upon it."

Our local correspondent writes: The consumption of gas at Southport during the week preceding Christmas Day constitutes a record. On Monday the amount consumed was 2,065,000 cubic feet; on Wednesday, 2,110,000 feet; on Thursday, 2,197,000 feet; Friday, 2,303,000 feet; and on Saturday 2,363,000 feet. For the week ending Dec. 25, the total amount of gas sent out was 14,636,000 cubic feet—the largest make of gas in the history of the concern. It is five years since as much as 2,062,000 cubic feet of gas was burned in one day at Southport, and that was on December 28, 1899. The best day last year just stopped short of that figure; the consumption being 1,997,000 cubic feet. The Gas Department could not have been in a better position than they were for coping with the recent big strain on their resources.

Sheffield.—During the week of fog the Sheffield Gas Company had heavy demands upon them. The normal consumption of gas at this season of the year is 15 million cubic feet per day, the product of 1500 tons of coal. On the 22nd ult., however, the consumption advanced to 18 million feet, representing 1800 tons of coal, the largest day's consumption ever recorded by the Company.

The following letter from Sir George Livesey on "London Fogs and the Gas Companies" appeared in "The Times" on Wednesday.

Sir,—The leading article in "The Times" of Saturday, on the fogs of the week, contains the interesting statement "that the fogs of the present day, even the worst of them, are definitely less filthy and less opaque than those of the early or middle Victorian period." Then it is said "that the change is commonly, and perhaps rightly, attributed to the extent to which the production of smoke has been diminished by legislation." The enforcement of the law against smoke has probably done a little good, but very little, because the smoke produced by the comparatively few factory chimneys is but as a drop in a bucket relatively to that from the innumerable domestic chimneys; the first-named being seen and palpable, while the other is unnoticed. The craze of the day is for more and more legislation, to which I would reply by the following quotation:—

> "How small, of all the ills that men endure,
> That part which laws or Kings can cause or cure."

If, however, London fogs are less black than formerly, it must be due to one or more causes. Will you allow me to say that probably the chief cause is to be found in the action of the gas companies during the last twenty years? They began by letting gas cooking-stoves on hire to their ordinary consumers; then, by the introduction

of slot meters, gas was brought within the reach of weekly tenants, of whom prior to (say) 1892 probably not 1 per cent. used gas, whereas now one may say its use is universal. I have not the figures of the Gaslight and the Commercial Gas Companies at hand, but I can give as a sample those of this [the South Metropolitan] Company. We have about 279,000 consumers (some 172,000 being fitted with slot meters); and about 212,000, or 76 per cent. of the total, have cooking-stoves belonging to the Company. There are also on hire 18,000 gas-fires in addition to, I believe, a much greater number of gas-fires and a moderate proportion of cooking-stoves owned by the consumers. The slot-meter consumers who have not the convenience for a cooking-stove are supplied with a boiling and grilling arrangement that often saves an ordinary fire.

Then there are the gas-engines and appliances for the use of gas for manufacturing and other purposes too numerous to mention, which substitute gas as fuel in place of coal. Further, the gas companies supply a smokeless fuel—coke—which is largely used for furnaces and domestic fires, displacing coal and preventing smoke. It is, therefore, in the direction of cheap gaseous fuel that the greatest hope of bating smoke lies.

The gas companies are public servants doing useful work; and I feel sure your sense of fairness will grant me the privilege of stating their case in your widely-read columns.

In the course of a lecture delivered by Sir Oliver Lodge last Friday in the Town Hall, Birmingham, on "Clouds and Wind," he said that if we wanted to cure town fogs, we must improve our methods of combustion, and not allow crude coal to be burnt in cities, the air of which was too valuable to be spoilt in this way. The coal ought to be broken up into its constituents; the coke being separated for use in iron furnaces or for other purposes. The gas, purified of the sulphur to a sufficient extent, should be supplied in large pipes to the cities for heating and cooking purposes. When this was done—and, so far as he knew, there was no reason except Governmental or Municipal reasons for not doing it—the air would become much cleaner and purer. The lecturer gave a laboratory demonstration to show how electrification can disperse fog.

At the meeting of the Gas Committee of the Oldham Corporation last Wednesday, the Gas Engineer (Mr. Tim Duxbury) reported that in the fortnight ending the 26th ult. 87,281,000 cubic feet of gas were made and 86,237,000 cubic feet delivered, compared with 79,401,000 and 79,751,000 cubic feet respectively in the corresponding period of 1903. The delivery of gas during the fortnight constituted a record. Mr. Duxbury reported that the carburetted water-gas plant at Hollinwood proved very valuable during the time of heavy demand, assisting to the extent of a million cubic feet per day; and there would have been a scarcity of gas for the mills and other places in the district but for the existence of the plant.

Fifty Years' Service.

New Year's Day saw the completion of fifty years' service on the part of Herr L. Körting to the Imperial Continental Gas Association. It is so well known in the gas industry of the world that it hardly needs mention here that Herr Körting is the Engineer of the Association at Hanover, that he is father of the successor of Mr. Edward Drory in the chief engineership at Berlin, and that he is the President for the second year of the German Association of Gas and Water Engineers, in which capacity he was present at the recent international gathering in London in connection with the Gas Exhibition. His has been a long and faithful service. The Chairman of the Imperial Continental Gas Association (Mr. J. Horsley Palmer) is going to the Continent; and next Sunday will, in celebration of the event, be entertaining Mr. Körting, together with various officers of the Association, at a banquet. Among others, the Chairman will have the felicity of welcoming Mr. William Drory, the Engineer at Frankfort, whose jubilee in the Association's service was celebrated last year. We add ours to the hearty congratulations which will be showered on Mr. Körting on this most interesting occasion.

A Message from Sir George Livesey to his Men.

In the "Co-Partnership Journal" for January, there is a Christmas and New Year's address by Sir George Livesey to the co-partners of the South Metropolitan Gas Company. In the opening sentences, he remarks: "My first word must be to express my thankfulness to God for restoring me to health and strength to again take my place among you. My second word must be to thank you all for your kind sympathy and good wishes for my recovery. You have shown this in various ways, and especially by the numerous messages and inquiries that have reached me, which are a type, I believe, of many more that had no means of reaching me. I am very glad to be back again after nearly three months' absence. For fifty-five years, I have never been absent for a month, and never for more than two or three days on two or three occasions on account of illness. For this also, I ought to be, and am, thankful; and I hope there may yet be useful work for me to do. It is a satisfaction to feel that with the good men and true at the head of the Company, all has gone well during my enforced absence. This, however, has been no surprise to me, knowing as I do the men and the system which govern the Company's working. I believe most strongly that the common interest and the mutual help that are part and parcel of the co-partnership system, form the true principle of successful and fair and honest business. If, therefore, the Company's business is conducted on these lines, its continued success and prosperity, as well as that of its workers, are assured."

THE PRINCIPLES OF LOCAL GOVERNMENT.

THOUGH the question of local self-government is one that concerns everybody, there are, with the exception of municipal officials and councillors, a very small number of people who pay any attention to the details. When the demand-notes come in—and perhaps at rare intervals when some new scheme is under discussion—there may be a small general display of interest; but it quickly passes away, and the ratepayer ceases to bother his head about the matter till again aroused by an out-of-the-way incident. Probably this regrettable state of affairs is to be accounted for by the somewhat "dry" nature of the subject; and therefore any effort to treat it in a simple and readable manner is to be welcomed. Such an effort has just been made, by an anonymous writer, in a handbook addressed to students of municipal accountancy and finance.*

This book has, it appears, been compiled primarily with the object of assisting those who are wishful to fit themselves for work in a municipal finance department; but it is also eminently suitable for the general public. In a remarkably small compass, the powers and jurisdiction of local government authorities are explained; and this enables the reader to properly follow the financial matters which are afterwards described. Successive chapters deal in a chatty way with a municipality's income and expenditure on revenue and capital account; and this, of course, is just the part of the subject on which the "outsider" is most generally in the dark, and therefore is most in need of assistance. Afterwards, we come to topics which have of recent times forced themselves into notice, and on which more or less pronounced views are held by a good many people. In the first place, there is a chapter on "Municipal Undertakings and Private Enterprise," in which the *pros* and *cons* of municipal trading are set forth in the form of ten arguments against such trading and the replies thereto. From the number of the arguments included, it will be gathered that the author has merely contented himself with setting forth in this interesting manner the main contentions on either side. Next we come to another question which, of course, has grown out of the last—the necessity or otherwise of providing for depreciation; and this is dealt with by means of lengthy replies to the following three queries: (1) Do the fixed assets of municipal undertakings depreciate notwithstanding repairs and renewals? (2) What are the different methods of providing for depreciation? (3) Which is the correct method? The concluding section is devoted to the auditing of municipal accounts; the various systems in vogue being outlined, and the recommendations of the last Joint Committee on Municipal Trading set forth.

From this brief notice, it will be seen that the book deals with many matters both of fact and of opinion; and being throughout written in a chatty and extremely simple style, it offers a pleasant method of obtaining an insight into the local government system of to-day. It is not intended to be a complete treatise on the subject, but to induce in students further study of the points raised, and to enable the general ratepayer "to obtain a better understanding of the volume issued by every municipality known as the Treasurer's Abstract of Accounts." It should succeed in both these objects.

THE LAW AS TO WORKMEN'S COMPENSATION.

Recommendations of the Departmental Committee.

THERE have recently been issued two voluminous Blue-Books dealing with the law relating to compensation for injuries to workmen, which are the outcome of the labours of a Home Office Departmental Committee, appointed as long ago as November, 1903. The members were Sir Kenelm Digby, K.C.B (Chairman), Sir Benjamin Browne, D.C.L., M.Inst.C.E., His Honour Judge Lumley Smith, K.C., Captain A. J. G. Chalmers, of the Board of Trade, and Mr. G. N. Barnes, the Secretary of the Amalgamated Society of Engineers; while Mr. R. R. Bannatyne, of the Home Office, acted as Secretary. The scope of the inquiry was a wide one—namely, to ascertain what amendments in the existing law were necessary or desirable, and to what classes of employments not now included the Acts could properly be extended with or without modification; and before arriving at their conclusions, the Committee held thirty-seven meetings and examined no less than seventy-six witnesses. In addition to this, they had to consider many written communications from Employers' Associations, Trades Unions, and Insurance Companies. In the course of their investigations, the Committee naturally found themselves confronted with questions of much difficulty; but they were greatly assisted by various authorities on the subject—special mention in this respect being made of Mr. A. H. Ruegg, K.C. In the present article it is intended to notice shortly some of the points in the report (which, apart from numerous appendices, occupies some 125 pages of the Blue-Book) that are of more particular interest to "JOURNAL" readers—leaving similar reference to the evidence for a future occasion.

The first part of the report deals with the history, scope, and operation of the Workmen's Compensation Acts of 1897 and 1900

* "Municipal Finance for Students," by "A Municipal Accountant." London: Messrs. Gee and Co.; 1904.

and their relation to pre-existing law. The Committee point out that the Acts are aimed at affording substantial relief from the consequences of misfortune, but not complete indemnity; and in order to go fully into the advisability of their amendment or extension, it is necessary, among other things, to form an estimate of how this great experiment in legislation has worked, whether it has fulfilled expectations, and what weak points have been disclosed. For a long time past, the Acts have been found fault with in many quarters as having given rise to an excessive number of contested cases. In this connection, the Committee state that there are various defects, both in the Acts themselves and in the machinery by which they are enforced, that give rise to much preventible litigation, though the amount of actual litigation produced has been very small when compared with the great number of cases settled by agreement. Even this proportion may, however, they think, be still further reduced by the amendment of certain parts of the Acts, and the provision of more effective machinery for expeditious and inexpensive settlement of doubtful questions of fact, especially by amendments tending to increase the importance of the functions of Medical Referees.

At the time the Bill of 1897 was before Parliament, there was considerable discussion as to whether or not it would operate in favour of increased safety to the workmen affected; but no evidence was brought before the Committee which enabled them to say that any great improvement in this respect could be placed to the credit of the Act—indeed, some of the testimony rather pointed in the opposite direction. Another question much canvassed at the time was as to the effect the measure would have upon the provision for industrial accidents made by Mutual and Friendly Benefit Societies. The inquiry has elicited the fact that the operation of the Act has largely put an end to those Societies for accident compensation which previously were supported by the joint contributions of employers and workmen, though there are schemes which continue unaffected. On the other hand, Benefit Clubs supported by the workmen themselves do not appear to have had their activity in any way diminished; and it is complained by employers that in cases of temporary partial incapacity the benefits given by these Societies, added to the amount of compensation obtained under the Act, often equal or even exceed the wages prior to the accident—thus furnishing a strong motive for unnecessarily delaying a return to work.

A very important part of the inquiry was that devoted to the pecuniary burden cast by the Acts upon employers. As to this, it is stated that the evidence abundantly showed that both employers and employed desire greater certainty, and a clearer definition of their rights, than is at present afforded. As far as the employers are concerned, this want of certainty is, of course, of itself a most important element of cost, inasmuch as the greater the uncertainty as to the liability the higher is the premium required by Insurance Companies to cover contingencies. With regard to the ultimate incidence of the increased cost of production caused by the Acts, the Committee content themselves with remarking that it appears that, in the first instance at all events, the burden must fall on the employer, though it may be that he finds some compensation in improved relations with his workmen, or in advantages resulting from a clear and definite obligation imposed on all employers engaged in the industry, instead of the more indefinite moral obligations which previously were felt to be binding by good masters but were neglected by the bad ones. The coal-mining industry, on account of its dangerous character, its liability to disaster on a large scale, its magnitude, and the vast national importance of its well-being, may, the Committee think, be taken as a crucial test of the success or failure of the Act. Their conclusion is that great advantages have been obtained by the workmen without imposing any undue pecuniary burden upon the employers.

Summing up the evidence with regard to the operations of Mutual Insurance Companies, which have been formed or adapted to protect employers of particular industries against the risks imposed upon them by the Acts, the Committee think the general inferences to be drawn are: (1) That hitherto the pecuniary burden imposed by the Acts upon the employer has not been excessive. (2) That this burden tends to increase, especially in consequence of the rapidity with which claims are growing, and the burden which is necessarily imposed by the increasing number of permanent cases; and that the Act of 1897 has not been sufficiently long in operation to permit of any really trustworthy estimate being formed of the limits which this increase will ultimately reach. (3) That if this last inference is well founded, the greatest caution is required before the personal liability already imposed by the Acts on the employer is materially increased, especially by any legislation which may add to the indefiniteness and the uncertainty of that liability, unless there are paramount reasons for the suggested change.

Turning to the point of view of the workman, the report states emphatically that the Acts have conferred substantial benefits on those who are in a position to take advantage of them. Only a few witnesses complained of the general inadequacy of them; the criticisms having been mainly directed to suggested anomalies which have created a sense of hardship and injustice. It was, however, proved that the Acts have largely increased the difficulties of old men finding and retaining employment; and in the case of partially maimed persons there was distinct evidence that they are frequently refused employment at their old trade, though perfectly able to earn full wages. To meet this, some of the witnesses suggested that a modified form of contracting out might be allowed in the case of old and partially maimed men, who would be gladly kept on by employers if they were free from the danger of having to pay compensation on the scale of the Act. The Committee recommend that it should be open to an employer, upon a certificate from the Medical Referee as to the enfeebled condition of an infirm or injured workman, to employ him on special terms as to compensation in case of death or accident. The Act should provide a minimum rate of compensation for this purpose; but parties should be free to make their own terms for a larger amount. The minimum suggested for old persons is 5s. per week for injury, and in the case of death (leaving dependants) £25. Persons over sixty years of age might be employed on these terms without a certificate. In the case of infirm persons under that age, including those partially maimed, the minimum should be 5s. or one-quarter of the weekly wages, whichever is the larger sum, for injury, and for death (leaving dependants) £25, or an amount equivalent to 156 times the quarter wages, whichever is the larger.

After an expression of regret that the power of arbitration given by the Acts to any Committee representative of an employer and his workmen has not been more largely adopted, the report deals with the amendments of the Acts which have been suggested or appear to be desirable. In the first place, it is not considered advisable that any attempt should be made to define the word "accident;" nor is any alteration recommended in the provision that, to afford ground for compensation, the accident must arise "out of and in the course of" the employment. With reference, however, to the stipulation that the accident must occur "on, or in, or about" the place or works, it is suggested that words should be added extending the obligation of the employer to cases where the accident happens to the workman elsewhere while actually engaged on the duties of his employment. As to the categories of employment embraced by the Acts, there appears to be no need for amendment so far as factories proper are concerned; but the Committee think that employment on, or in, or about a dock, quay, or warehouse might be included without introducing the fiction that they are factories. Unless the question has been authoritatively settled before legislation takes place, it is suggested that a "wharf" should be defined "as a place for landing or embarking goods or passengers contiguous to water;" while "employment on, or in, or about a warehouse," should be defined as "employment on, or in, or about the storage of goods for sale or safe custody by way of trade or for purposes of gain." Instead of the very artificial sense given to the word "factories" in applying it to the machinery or plant used in the process of loading or unloading or coaling, there might be substituted the words "employment in the process of loading or unloading or coaling any ship in any harbour or canal." No recommendation is made with regard to the definition of a "mine;" but as to "quarries," it is contended that the Act should apply irrespective of the depth of the quarry. The definition of "engineering work" as meaning "any work of construction, or alteration, or repair of a railroad, harbour, dock, canal, or sewer," and as including "any other work for the construction, alteration, or repair of which machinery driven by steam, water, or other mechanical power is used," appears to the Committee unsatisfactory in respect both of what it includes and what it excludes; and they suggest the addition of words to the works included, to the effect that they "should be of a like nature to those already mentioned." After full consideration, it is decided that the Acts should be extended so as to cover all building operations—*i.e.*, all erections upon the surface, including preparing for and carrying out the foundations—and be irrespective of the material used. This would, of course, get rid of the existing condition (which has been the cause of some extraordinary litigation) that some part of the building concerned must exceed 30 feet in height.

With respect to the persons who are entitled to claim as "dependants," it is stated that a case has been made out for the inclusion of brothers and sisters in instances where total or partial dependency is proved in fact. Various suggestions are also made as to the payment of compensation money, so as to afford greater protection to widows and children; and the work of distribution is put upon County Court Judges and Registrars. At present, of course, a workman is not entitled to compensation in respect of any injury which incapacitates him for less than a fortnight, while in any case payments are only made as from the beginning of the third week. In spite of strong representations on behalf of the men, the Committee feel obliged to come to the conclusion that there are no sufficient reasons for the transference to the employer of the burden of the compensation for the whole or any part of the first two weeks. As to the provision in the Act of 1897 that "any weekly payment may be reviewed at the request either of the employer or the workman, and on such review may be ended, diminished, or increased," they are of opinion that the return of earning capacity, when properly ascertained, ought to be accompanied by a proportionate reduction of the compensation paid; but better provision should be made than now exists for ascertaining the "earning capacity." They do not think that a workman should be given a right to apply for compulsory commutation of weekly payments, chiefly owing to the fear that this would lead to an increase of the mischiefs resulting from compensation being given by way of a lump sum.

It is admitted that masters have just cause of complaint in respect to proceedings being taken first under the Common Law

or the Employers' Liability Act, and then (if these fail) being renewed under the Compensation Acts; and the report suggests that this abuse might be checked by means of a provision enabling employers to apply to the County Court Judge or to the Sheriff for a stay of proceedings under the Common Law or Employers' Liability Act, on evidence that the workman had an adequate remedy under the Compensation Acts. The acceptance or recovery of compensation under a County Court judgment or agreement should be a bar to subsequent proceedings either at Common Law or under the Employers' Liability Act, and *vice versâ;* and the power to assess compensation after unsuccessful proceedings under the last-named Act should be repealed. The Committee do not, however, think that the Compensation Act should be consolidated with the Common Law or the Employers' Liability Act.

Considerable space is devoted to a consideration of the machinery for carrying out the Acts. Among the recommendations made is one that notices of accident should be served within six days, notices of claim within three months, and proceedings commenced within three months of the date of the notice of claim. The evidence pointed strongly to the fact that the law governing the character and functions of the office of Medical Referee should be revised; and the selection of a public official rather than a medical man in practice (remunerated by salary, and not by fees) is suggested. After studying the plan in vogue at the South Metropolitan Gas-Works and other places, the Committee say that they see no grounds for any interference with the present system of so-called "contracting-out" schemes, much less for their abolition; and they recommend that the provisions relating to them should remain substantially unaltered.

The third part of the report deals with proposals for the extension of the provisions of the Act of 1897 to other employments, and for cognate legislation; the conclusion arrived at being that it would be impracticable to extend the Act to all contracts of employment, but that such extension should be proceeded with according to the special circumstances of different branches of industry. With regard to seamen, the Committee remark that, while it would not be advisable to extend to them the provisions and machinery of an Act which was not originally intended to be applied to them, and which if applied would be in material conflict with another Act specially framed for them, the question remains to be considered by what means the principle underlying the Workmen's Compensation Act can be properly applied to them. They, however, see no reason why the larger class of workshops (as distinct from factories) should not be brought within the Act, as well as persons employed in the care of horses and locomotives. The Committee say they cannot but attach great weight to opinions expressed in favour of statutory regulations of Insurance Companies carrying on accident business so far as regards the obligation to make annual returns disclosing the extent of their liabilities and the provision made to meet them; and they close their exhaustive report with the following remark: "Beneficial as we believe the legislation of 1897 to have been on the whole, we do not think it can be regarded otherwise than as a step in the direction of a more comprehensive system."

The report (which included altogether 42 recommendations) was signed by all the members of the Committee; but Sir Benjamin Browne and Captain Chalmers added a memorandum explaining that, while they agreed with the report, and considered that it was absolutely necessary in common justice to extend the workman's claim for compensation for accidents happening away from, as well as in or about, the factory to which he belongs, this should be coupled with some substantial modification of the liability of the so-called undertaker for accidents to workmen employed by some of those who may at present be classed as sub-contractors. Where an employer has a factory, and sends men elsewhere to erect or put together work made therein, clause 4 of the Act of 1897 (the Undertaker and Sub-Contractor Clause) should not apply either to the workmen so sent out, or to any other workmen who may be engaged to work with or help them. These workmen should look to their own employer, and to him only. It would, they urge, also be fair to say that no one should be liable, as undertaker, to the workmen of a sub-contractor whom he has not himself selected. Mr. Barnes appends another memorandum, in which he expresses himself as being in favour of compulsory insurance, provided insurers are offered national insurance as an alternative to that with the ordinary companies.

At a recent meeting of the Improvement Committee of the Leeds Corporation, the resignation of Mr. George Hewson, Assistant-Engineer in the Water Department, and son of the City Engineer, was accepted. He occupied the position of Resident Engineer at the new water-works of the Corporation.

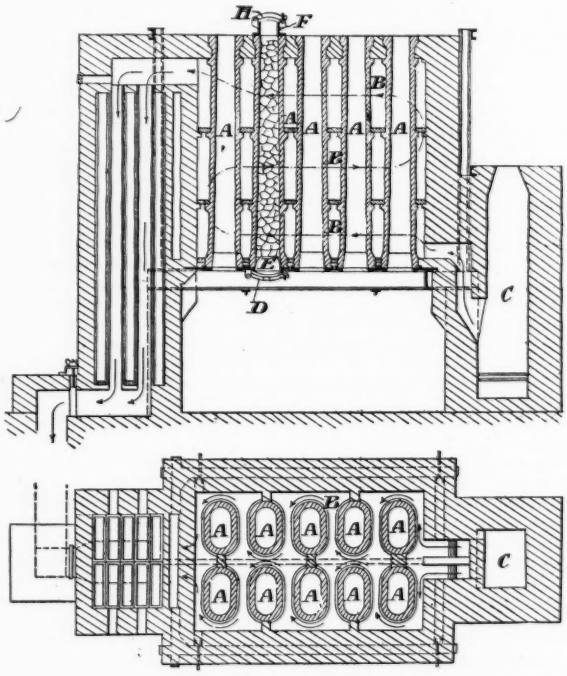
Two fixtures of great interest have been arranged by the Committee of the Junior Institution of Engineers. The first of these is for next Saturday afternoon, when there will be a visit to the Voelker Incandescent Mantle Company's factory at Wandsworth; the Directors having kindly arranged to keep the works running so that the members may see all the processes of manufacture. The second is a lecture (illustrated by experiments and lantern slides), on the "Theory of the Incandescent Mantle," to be delivered by Professor Vivian B. Lewes, who is an honorary member of the Institution, at the Westminster Palace Hotel on Friday, the 13th inst.

THE LATEST GERMAN FORM OF VERTICAL RETORT SETTING.

Making Gas "Entirely Free from Naphthalene."

As is well known, experiments have for some time past been carried out in certain German gas-works with various arrangements of vertical retorts; but no details have so far been forthcoming as to the results attained. Considerable interest will consequently attach to one of the specifications issued last week by the English Patent Office—No. 1393, dated Jan. 19, 1904—taken out in the names of the Deutsche Continental Gas Gesellschaft and Dr. Julius Bueb, both of Dessau. The invention is described as relating to the manufacture of illuminating gas from coal, and consisting in "an improved method of distilling coal, whereby gas is obtained from the retorts entirely free from naphthalene, and a liquid tar is produced, while the amount of apparatus and labour, and consequently the cost, are reduced."

The patentees claim as their invention: "The manufacture of gas by subjecting coal to distillation in a vertical retort heated to a higher temperature than is usually employed in gas manufacture, so that coke is formed from the internal walls of the retort inwards, and the gas generated passes inwards and upwards through the central portion of the charge; the retort being charged with coal up to the same level as that up to which the external heat is applied, so that no space is left in which tar can quickly separate—it being compelled to pass up through the uncoked internal portion of the charge before a leving the retorts."



They say: It is well known that, making coal gas as hitherto practised, a great inconvenience is that the gas obtained contains a considerable amount of naphthalene, which requires to be removed from the gas before it is ready for use; and its removal necessitates a considerable amount of apparatus, labour, and expense. Another inconvenience is that tar which is produced simultaneously with the gas contains a considerable amount of carbon of which not only is the gas deprived, but it reduces the value of the tar and occasions objectionable thickening of the tar in the receptacle, or condenser, and such tar interferes with, and greatly disturbs, the work. This invention avoids these objections; the gas as manufactured leaving the retorts free from naphthalene, and the tar carried along with the gas being "substantially free from carbon proper, and being a liquid oil technically pure, instead of being a semi-liquid mass difficult to handle and interfering with the work."

The invention is based upon trials and experiments by which it has been found that the formation of naphthalene does not necessarily follow, or accompany, the separation of the gas from the coal, but takes place as soon as the heavy hydrocarbons contained in the gas distilled from the coal are heated beyond a certain temperature, and, further, that the tar rich in carbon is only produced if the oils forming its chief part are, immediately after their formation, separated from the coal from which the gas is taken off, and are allowed to take up and carry off the smoke, or carbonaceous dust, produced in the gasification.

As already mentioned, it is proposd to employ vertical retorts; and the free spaces hitherto left in the retorts for collecting the gas arising from the coal before the gas is discharged into the receptacle or condenser are dispensed with. The retorts have

preferably an oval cross section, and are made uniformly taper—their narrower parts being uppermost. Their height is preferably at least five times their breadth at the bottom. They are disposed in an oven, so that the gases by which they are heated pass around them in several superposed zones, in the lowermost of which the temperature is the highest. The retorts are open both top and bottom, and are fixed tightly in the bottom and top plates of the oven. They are provided at the top with a hopper or other device for the introduction of the charge, and with a gas outlet; and they are provided at the bottom with a horizontal shutter or similar device. They are at all times kept full of coal to a level corresponding to that which the surrounding fire reaches; and the bottom of the retort and of the furnace should be at, or about, the same level.

The retorts are first heated to a very high temperature (higher than that employed ordinarily in distilling coal), and then they are filled with coal while maintaining the temperature and the heating is continued—care being taken that the retorts remain filled, or nearly so. Owing to the great heat, gas is very quickly generated from the portions of the coal in contact with the internal surfaces of the retorts; and such portions are at once converted into compact coke, "which is impermeable to the gas generated." The gas therefore passes from all points of the periphery inwards and upwards through the uncoked, and easily permeable, portions of the charge. By the passage of the gas through the inner uncoked and cooler parts of the charge, the temperature of the gas is prevented from rising beyond the limit at which the heavy hydrocarbons of the gas would be decomposed into naphthalene. The crust of coke formed around the interior of the retort completely protects the gas from contact with the highly-heated walls of the retorts. The gasification continues, and the thickness of the annular crust of compact coke gradually increases, so that the diameter of the uncoked vertical core of the coal continually decreases until the whole of the charge has been subjected to gasification and has become coked. There being no space in which the tar can quickly separate from the coal, it is compelled to pass upwards through the uncoked internal portion of the charge before leaving the retorts, "so that the smoke and carbonaceous dust mechanically carried in the tar is retained and afterwards subjected, with the remaining coal, to gasification." As the tar oils are not under these circumstances decomposed, they escape, in the form of condensable vapours (free, or nearly free, from carbon proper) to the hydraulic main, where they are collected as a liquid oil poor in carbon.

In view of the upwardly diminishing area of the retorts, to ensure the formation of the annular crust of coke as uniformly as possible throughout the entire length of the retorts, the external flues for heating the retorts should be so arranged that the upper and narrower parts of the retorts are less heated than the lower and broader parts, whereby the thickness of the crusts of coke formed on the internal surfaces of the retorts gradually diminishes from the bottom to the top.

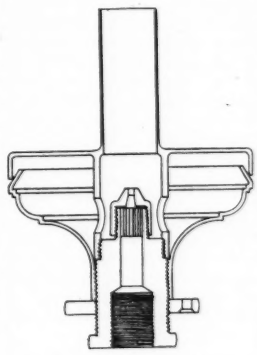
In the accompanying vertical longitudinal section and sectional plan, A are the retorts open both top and bottom; the narrower parts being uppermost. B are three sets of superposed flues by means of which the retorts are externally heated. The heating gases pass from a producer C into the flues—their course being indicated by dotted lines and arrow heads. The retorts are closed at their bottom ends by covers D provided on their inner side with projections E, the purpose of which is to ensure that the lower end of the charge of coals shall always be above the lowermost end of the retort body—*i.e.*, on a level with the bottom plate of the oven. The top part of each retort is surmounted by a mouthpiece F provided with a gas outlet and a cover H. In filling the retorts, the bottom covers D are first closed; the covers H opened; and the charges of coal introduced through the mouthpieces F. When the retort is full, the covers H are closed and the gasification begins at once.

The gas produced does not, it is said, contain naphthalene, or at most only traces of it. The best illuminating gas hitherto produced, it is pointed out, causes a solution of picric acid to quickly become turbid by reason of the formation of picrate of naphthalene; but after passing the gas produced according to this invention for several days through a solution of picric acid, the solution will not show any turbidity. The tar produced, it is mentioned, shows neither the characteristic black colour, nor the semi-liquidity of the tar produced in the ordinary manufacture of illuminating gas, and is in "the entirely new form of a brown liquid oil which does not thicken in the hydraulic main, and is very easy to work for obtaining its valuable constituents." Not only is the gas equal to the best illuminating gas produced by other known processes, but the yield is said to be greater, because the carbon particles which have hitherto been taken up by the tar are retained and subjected to gasification. Moreover, much less apparatus is required, and there is a great saving in labour; the coke obtained is also more compact.

The Gas Referees and the Gas Supply of the Metropolis.—The Gas Referees have issued a circular intimating that they have decided that as there is just now nothing of importance to be changed in their "Notification" for the past year, and as considerable changes are likely to be made in the Acts affecting the supply of gas in the Metropolis during the coming session, which may require the issue of fresh instructions later in the year, they will leave the "Notification" for 1904 in force for the present.

BIBBERO'S INCANDESCENT GAS-BURNER.

In describing M. Bibbero's incandescent gas-burner last week, by which he regulates the air admission, and protects it from injurious influences such as draughts, dust, and other floating particles, we were unable, from reasons associated with the patent, to refer to certain improvements, but are now at liberty to do so. In the latest form of the burner, there are fewer separate parts, but the same result is achieved, with the additional one that means are provided for the regulation of the gas supply according to the quality and pressure of the gas. The inverted movable cone by which the air supply is regulated, and the air-admission holes protected, is practically the same as in the pattern of burner described last week; but in the form now under notice, the upper rim of the cone is bevelled inwards, and the rim of the cap above is outside the cone rim. It is pointed out that this offers a greater protection against dust than the first described type. The cap in this case has a flat top, and is cast on the central tube of the burner. For further information as to how the air supply is regulated, readers must be referred to last week's article. The means of regulating the gas supply are simple. The socket and gas-nipple at the bottom of the burner are made in one piece. The nipple is formed of an extension from the socket base, but is of smaller diameter. At the top, there is a small tapered projection, around which are a number of tiny V-shaped apertures for the emission of the gas. The regulation of the gas supply is accomplished by a cap with a central hole, through which the tapered projection passes. As the cap is screwed downwards, the size of the hole is diminished, and consequently the flow of gas is decreased; the inscrewing of the cap enlarges the opening, and consequently allows more gas to pass. The construction of the burner prevents the ready manipulation of the regulating-nipple by interfering persons; but it is to be also made so that, if required, the regulation can be easily performed from outside the burner. The patentee calls attention to the advantage of the burner for street and maintenance purposes; and to its application in all districts, no matter what the pressure or quality of the gas. The sale of the burner is in the hands of Messrs. Falk, Stadelmann, and Co.



REDMAN'S PATENT WASHER-SCRUBBER.

In an article in the "Journal" for Dec. 20 we had pleasure in drawing attention to the new carbonizing projects of Mr. Thos. Redman, of Bradford, in which he aims at the realization of the utmost productive advantage from the heated retort surface. In the present article, attention is turned to another sphere into which Mr. Redman's inventive fertility has been directed. As the result of his study of the question of the purification of gas, he has adopted the fundamental principle that the more minutely the gas can be divided in passing through its refining treatment, the greater the perfection attained. With this guiding principle before him, he has designed a new mechanical washer-scrubber, which it is the object of this article to describe.

Externally the machine takes the form of its predecessors; but internally it differs in arrangement. In the first place, division plates between each succeeding drum are not essential, but are nevertheless provided, as he fears that such a radical omission would not at the present day be acceptable. The drums, however, can be as numerous as the preference of the engineer may dictate; but the inventor contends that his method of very finely deviding the gas, by means of his simply devised honeycombed cells, obviates the need of much repetition in chambers. The drums vary in their structural features from anything at present in use; being composed of two side outer perforated walls, and divided angularly, similarly to the drum of a wet meter; thus forming (in the model which we have seen) a series of eight chambers. Each of these chambers is charged, following the oblique form of the division-plates, with plain and (one might from an examination say thousands of) corrugated plates to the full extent, and in such a manner that, as the drum revolves, the gas is drawn in when the liquor is leaving the cells; and, of course, on the opposite side the gas is forced out, and displaced by the liquor. In each succeeding compartment of a drum, the plates may, if desired, be reversed—that is to say, in one compartment they are flat to the sides of the drum, and in the succeeding one flat to the angular division-plates, and so on right round the drum; and the drums themselves are alternately so fixed on the shaft that the arrangement of the nests of corrugated plates does not correspond. This reversal of the plates causes the gas to be taken successively from one drum to another, and prolongs the travel of the gas from one side of the machine to the other. A point of further interest is that the corrugated plates with which the compartments are charged are subdivided into suitable sizes;

and this has a two-fold use—it makes their extraction and replacement an easy matter, and the breaking up has the effect of producing an elbow in them which serves to further fractionate and scrub the gas in its passage in and out. The corrugating of the plates precisely in the form in which Mr. Redman wished them presented a matter of some difficulty, at first. He could not find that his requirements were to be supplied from the ordinary sources; and he has therefore himself got over the difficulty by designing for the purpose a machine which, from the samples of the work seen, does it with beautiful precision.

Now Mr. Redman claims that he is able, by this method of constructing the drums, to utilize, in an effective manner, the whole of the space from the shaft to the periphery of the drums. Not only in this respect is great efficiency realized, but he holds that the extent of scrubbing surface obtained, through this nesting of the finely corrugated plates, making perfectly honeycombed chambers, far outstrips many existing arrangements—for example, those in which solid bodies are used—with drums of equal size. What he contends a washer-scrubber should be is (so to speak) a breathing apparatus—constantly inhaling and exhaling the gas, and, above all, it should be a machine in which the gas is split up into an innumerable number of thread-like streams, and then further broken up in their travel through the apparatus, and thus submitted to the washing fluid. This is, in his view, the only satisfactory way of attaining the highest efficiency.

To come back again to the machine, and one or two further practical points about its construction. It is proposed to make each section of the apparatus of such capacity as to deal with an amount exceeding the maximum make of the gas. Assuming that the make is 20,000 cubic feet per hour, and each drum is dealing with from 24,000 to 25,000 cubic feet—that is, an excess of 25 per cent.—the surplus is then, as it were, handed back again from the outlet to the inlet of each individual drum, and passes in again with the crude gas—that is to say, "crude" at that stage of the purification—and so avoiding slip. What is practically a self-sealing joint between the drum plate and the partition in present forms of apparatus is not going to be utilized in this new machine. Among other points, to avoid undue strain and wear and tear upon the end journals, each drum is supported on each chamber division-plate, and friction is obviated by the plentiful provision of roller bearings. In regard to the compartments throughout the series of drums, all parts are accessible and quickly renewable without completely disorganizing and taking down the plant.

These are the considerations Mr. Redman advances as being the commendable features of his new design of washer-scrubber.

THE FLOW OF GAS

THROUGH PASSAGES IN GAS APPARATUS, OPENINGS IN PLATES, VALVES, Etc.

By F. Southwell Cripps, Assoc.M.Inst.C.E.

[Right of Reproduction is Reserved.]

Tables and diagrams have been issued from time to time for determining the various problems relating to the discharge of gas through "long" pipes; but nothing has been done, so far as the author is aware, to facilitate the calculations in connection with the flow of gas through openings in plates, valves, or passages in gas apparatus leading from one chamber or division to another, or in "short" pipes between different apparatus. The "Table of Constants" accompanying this article, and the rules and examples which follow, will enable anyone to determine, with comparative ease, most practical questions likely to arise.

It should be noted that the form of opening—*i.e.*, whether round, square, irregular, or conical—would influence the discharge. If the opening be very irregular in outline, or a combination of several openings, or having a long perimeter as compared with the area, or if the flow is distorted and thrown out of a direct course, if the gas is much baffled, and eddies are set up, the discharge would be less than if the gas has a straight run through a smooth channel, without any disturbing influences to contend against.

In formulating the following rules, it has been considered desirable to err on the side of safety; and therefore what may be termed theoretical requirements have been modified, so as to give smaller discharges and greater pressures and areas than might be thought necessary in some instances. It might be quite safe, under certain conditions, to allow 25 or even 50 per cent. increase in the discharge over that found by the rules; and, on the other hand, cases might arise in which it is possible the discharge would be retarded by 25 per cent.

It is obvious that no rule or table, to be of any practical use, could be given to exactly fit every possible case; and therefore what follows must be modified by the user as his judgment directs. The object has been to give general rules, of extremely simple character, which are approximately correct, and which may be readily applied, rather than to strive after mathematical exactness, which can scarcely be attained in practice.

The pressures given in the table are the "difference in pressures." That is, if gas is passing from one division to another, such as on the two sides of a governor—the inlet and the outlet side—the "difference in pressure" means the difference between the inlet and the outlet pressures. If the gas escapes direct into the air (or at atmospheric pressure), then the full pressure in the table must be taken.

The rules are printed in full at the foot of the table; but they may be expressed algebraically thus:—

Let Q = the quantity discharged per hour.
p = the difference in pressure, in inches of water.
A = the area of the opening, or gas way, in square inches.
C = the constant in the table.

Rule I.—Given p and A, required Q.
Find C opposite p in the table.
Then Q = C A.

Rule II.—Given Q and A to find p.
$\frac{Q}{A} = C$. Opposite C find p in the table.

Rule III.—Given Q and p to find A.
Find C opposite p in the table.
Then $A = \frac{Q}{C}$.

A few examples should make the rules quite clear.

Rule I.

Example (1).—What quantity of gas would escape into the air through a hole 3 square inches in area in the top of a gasholder under a pressure of 63-10ths?

Ans.—Opposite 6·3 ins. in the table will be found the constant 3828, which multiplied by the area, 3 = 11,484 cubic feet of gas per hour.

Example (2).—How much gas would be lost through a pinhole $\frac{1}{1000}$th of an inch in area under a pressure of 15·10ths?

Ans.—Constant opposite 1·5 ins. = 1868, which multiplied by the area ·001 = 1·868 cubic feet of gas per hour.

Example (3).—How much gas will pass through an opening of ·25 square inch, under a pressure of $\frac{1}{100}$th of an inch?

Ans.—Constant opposite ·01 = 152, which multiplied by ·25 = 38 cubic feet of gas per hour.

Example (4).—Given two vessels connected by an opening or passage way having an area of 20 square inches, the pressure of gas in the first vessel is 15 inches, and that in the second vessel 12 inches. At what rate per hour will the gas pass from one to the other, the pressures remaining constant?

Ans.—The "difference in pressure" is 3 inches, the constant for which is 2641, which multiplied by the area of the opening, 20, gives 52,820 cubic feet as the quantity passing per hour.

Example (5).—In the last example, suppose the difference in pressures was only ·001 of an inch, what quantity would then pass?

Ans.—Constant = 48, which multiplied by 20 = 960 cubic feet per hour.

Rule II.

Example (1).—What difference in pressure is required to pass 10,000 cubic feet of gas per hour through an opening of 100 square inches area?

Ans.—$\frac{10,000}{100}$ = 100. Opposite the nearest constant in the table (108) is found ·005, or $\frac{5}{1000}$ths of an inch pressure.

Example (2).—A governor passes 40,000 cubic feet per hour through an open way of 10 square inches. The pressure on the works side is 9 inches. What will be the outlet pressure on the town side?

Ans.—Find the constant due to quantity and area, $\frac{40,000}{10}$ = 4000, opposite which in the table is found the pressure of 6·9 inches. This 6·9 inches is the pressure absorbed in forcing the gas through the governor, or the difference in pressure. Hence, if we deduct it from the initial pressure of 9 inches, we have the outlet or town pressure = 2·1 inches or 21-10ths.

Rule III.

Example (1).—What area of opening is required to allow of 600 cubic feet of gas per *minute* passing, under a difference in pressure of 1-10th?

Ans.—600 cubic feet per minute = 36,000 per hour. The constant opposite pressure is 482. Then $\frac{36,000}{482}$ = 74·7 square inches required, which, if the opening be circular, corresponds with a diameter of about $9\frac{3}{4}$ inches.

Example (2).—It is required to pass 50,000 cubic feet of gas per hour through an opening in an apparatus, without absorbing more than $\frac{1}{10}$th of an inch pressure by friction. What must be the area of the opening?

Ans.—C = 152 from table. Therefore $\frac{50,000}{152}$ = 329 square inches, or (say) $20\frac{1}{2}$ inches diameter.

Example (3).—The pressure on the works side of a governor is 65-10ths and on the town side 30-10ths. What would be the approximate area of the opening, when the governor is passing 20,000 cubic feet of gas per hour?

Ans.—The difference in pressure = 65 − 30 = 35. The constant for 35-10ths is 2853. Hence $\frac{20,000}{2853}$ = about 7 square inches, the area of the open gas way.

TABLE OF CONSTANTS FOR THE

DISCHARGE OF GAS, IN CUBIC FEET PER HOUR, THROUGH OPENINGS

IN VALVES, PASSAGES IN GAS APPARATUS, SHORT PIPES, &c., UNDER PRESSURES (IN INCHES OF WATER), FROM ONE THOUSANDTH OF AN INCH TO FORTY POUNDS PER SQUARE INCH.

By F. SOUTHWELL CRIPPS, Assoc.M.Inst.C.E.

[*The Right of Reproduction is Reserved.*]

p Pressure.	C Constant.	*p* Pressure.	C Constant.	*p* Pressure.	C Constant.	*p* Pressure.	C Constant.	*p* Pressure.	C Constant.	*p* Pressure.	C Constant.	*p* Pressure.	C Constant.	*p* Pressure.	C Constant.	*p* Pressure.	C Constant.
·001	48	**1** inch	1525	**3** ins.	2641	**5** ins.	3410	**7** ins.	4035	**9** ins.	4575	**20** ins.	6820	**40** ins.	9645
·003	84	1·1 ,,	1599	3·1 ,,	2685	5·1 ,,	3444	7·1 ,,	4063	9·1 ,,	4600	21 ,,	6988	41 ,,	9765
·005	108	1·2 ,,	1670	3·2 ,,	2728	5·2 ,,	3478	7·2 ,,	4092	9·2 ,,	4626	22 ,,	7153	42 ,,	9883
·007	127	1·3 ,,	1739	3·3 ,,	2770	5·3 ,,	3511	7·3 ,,	4120	9·3 ,,	4651	23 ,,	7314	43 ,,	10,000
·009	144	1·4 ,,	1804	3·4 ,,	2812	5·4 ,,	3544	7·4 ,,	4148	9·4 ,,	4676	24 ,,	7471	44 ,,	10,116
·01	152	1·5 ,,	1868	3·5 ,,	2853	5 5 ,,	3576	7·5 ,,	4176	9·5 ,,	4700	25 ,,	7625	45 ,,	10,230
·02	216	1·6 ,,	1929	3·6 ,,	2893	5·6 ,,	3609	7·6 ,,	4204	9·6 ,,	4725	26 ,,	7776	46 ,,	10,343
·03	264	1·7 ,,	1988	3·7 ,,	2933	5·7 ,,	3641	7·7 ,,	4232	9·7 ,,	4750	27 ,,	7924	47 ,,	10,455
·04	305	1·8 ,,	2046	3·8 ,,	2973	5·8 ,,	3673	7·8 ,,	4259	9·8 ,,	4774	28 ,,	8070	48 ,,	10,565
·06	374	1·9 ,,	2102	3·9 ,,	3012	5·9 ,,	3704	7·9 ,,	4286	9·9 ,,	4798	29 ,,	8212	49 ,,	10,675
·08	431	**2** ins.	2157	**4** ins.	3050	**6** ins.	3735	**8** ins.	4313	**10** ins.	4822	**30** ins.	8353	**50** ins.	10,783
·1	482	2·1 ,,	2210	4·1 ,,	3087	6·1 ,,	3766	8·1 ,,	4340	11 ,,	5058	31 ,,	8491	60 ,,	11,813
·2	682	2·2 ,,	2262	4·2 ,,	3125	6·2 ,,	3797	8·2 ,,	4367	12 ,,	5283	32 ,,	8627	100 ,,	15,250
·3	835	2·3 ,,	2313	4·3 ,,	3163	6·3 ,,	3828	8·3 ,,	4393	13 ,,	5498	33 ,,	8760	lbs. per sq.in.	
·4	964	2·4 ,,	2363	4·4 ,,	3199	6·4 ,,	3858	8·4 ,,	4420	14 ,,	5706	34 ,,	8892	**5** ,,	17,951
·5	1078	2·5 ,,	2411	4·5 ,,	3235	6·5 ,,	3888	8·5 ,,	4446	15 ,,	5906	35 ,,	9022	**10** ,,	25,386
·6	1181	2·6 ,,	2462	4·6 ,,	3271	6·6 ,,	3918	8·6 ,,	4472	16 ,,	6100	36 ,,	9150	**15** ,,	31,092
·7	1275	2·7 ,,	2506	4·7 ,,	3306	6·7 ,,	3947	8·7 ,,	4498	17 ,,	6288	37 ,,	9276	**20** ,,	35,902
·8	1364	2·8 ,,	2550	4·8 ,,	3341	6·8 ,,	3977	8·8 ,,	4524	18 ,,	6470	38 ,,	9401	**30** ,,	43,971
·9	1447	2·9 ,,	2597	4·9 ,,	3376	6·9 ,,	4006	8·9 ,,	4549	19 ,,	6647	39 ,,	9524	**40** ,,	50,773

RULE I.—To find the **gas passed per hour** under a given pressure: Multiply the area of the opening in square inches by the constant (C) opposite the given pressure (*p*). The product will be the quantity in cubic feet.

RULE II.—To find the **pressure** necessary to pass a given quantity of gas per hour through an opening of given area: Divide the quantity by the area of the opening in square inches. The pressure (*p*) will be found opposite the nearest constant (C) to this in the table.

RULE III.—To find the **area of opening** required to allow of a given quantity of gas passing per hour, under a given pressure Divide the quantity by the constant (C) opposite the given pressure (*p*). The quotient will be the area of the opening in square inches.

NOTE.—In all cases the "pressure" means the *difference in pressures* between the inlet and outlet sides of the opening. For example, if gas is passing between two vessels in which the pressures are 8-10ths and 5-10ths respectively, the "difference in pressure," which causes the gas to flow from one to the other, is 3-10ths.

ELECTRICALLY-DRIVEN PUMPING PLANT FOR WATER SUPPLY AND STORAGE OF WATER UNDER PRESSURE.

By J. Hutton, of Scarborough.

[Extracts from the Last Paper read at the Winter Meeting of the British Association of Water-Works Engineers.]

The paper describes a pumping plant, with reservoirs, &c., recently installed by the author for the water supply of the village of Wykeham, Yorks., and for a nobleman's residence in that district.

When selecting the motive power necessary for pumping, it was at first proposed to use a windmill; but the high initial cost and unsightly appearance of these otherwise useful appliances, decided the author to recommend the use of an electric motor, worked by current obtained from the electric plant primarily installed for the lighting of Wykeham Abbey, which is situated about 1200 yards from the spring. The motor is automatically controlled, so that no continuous attention is required; and the reservoir is continuously kept full.

The well, generating station, and reservoir are situated at the three corners of a triangle, the sides of which are from 800 to 1200 yards in length. The generating plant—which consists of a loco-type boiler with enlarged fire-box for burning inferior fuel, a compound medium-speed engine by Robey and Co., of Lincoln, developing 40 brake horse power, dynamo, booster, and 200-volt storage battery with a capacity of 470 ampere-hours—is of the type usually adopted for electric lighting. Current is conveyed from the generating plant to the pump motor through a concentric cable carried underground, and of 60-ampere capacity.

The pumping plant consists of a three-throw pump with pistons 4 inches in diameter by 6-inch stroke, working at a speed of 60 feet per minute. The pump is fitted with single-reduction gearing, belt-pulley, and rawhide pinion on the countershaft. The author has found the use of rawhide pinions highly beneficial in reducing the noise and vibration in high-speed toothed gearing; the area of the teeth being in all cases made ample for the work required. The pump is driven by belting from a 4-horse power compound-wound motor, which absorbs about 15 amperes at 200 volts (or three units per hour), when pumping at the rate of 350,000 foot-gallons per hour, which is the normal load on the plant.

The reservoir is situated 900 yards from the pump-house, and is supplied through a 3-inch cast-iron pumping-main. As the starting effort required to put in motion a column of water of this length is somewhat high, it is necessary that the plant should start slowly, and the motor have a high starting torque. For this purpose, in compounding the motor, rather more series coils than usual are put on. The method of control at starting need not be minutely described; but, speaking generally, the rheostat is of the ordinary solenoid type, with an oil dash-pot for regulating the speed of operation. As previously stated, the plant is automatic, its operation being governed by the level of the water in the reservoir—the pump re-starting when this level has fallen any desired amount, say 1 foot, and stopping as soon as the reservoir is full. This regulation is accomplished electrically, and might, of course, have been done by arranging a float at the reservoir to make and break the main circuit supplying the motor; but to this, though obviously a simple way, there were several serious objections. In the first place, it would here have involved the use of an additional half-mile of heavy and expensive cable; and, secondly, the making and breaking of the main current would have caused so much sparking at the float-switch contacts, that its working would probably have been uncertain. For these reasons, the device of shunting only a small amount of current through a branch line, carried from the pump-house to the reservoir, was resorted to; the making and breaking of this branch circuit operating a relay main switch fixed in the pump-house. For this arrangement, a light twin cable, consisting of two 16-gauge wires insulated and sheathed in lead, was quite sufficient, as the proportion of current carried to the reservoir float-switch is less than 2 per cent. of the total current absorbed by the motor.

The water-level in the well is 8 feet below the surface of the ground; and the spring gives a supply of 90 gallons of water per minute, which is fairly constant all the year round. The reservoir, built of blue bricks in cement, has a capacity of 45,000 gallons, and is divided into two parts, in order that cleaning operations and repairs may not involve the stoppage of the supply. The total head against which the water is pumped is 98 feet; and the pump normally delivers 3500 gallons per hour. At the reservoir, all supply and delivery valves are duplicated, and, in addition to the Wykeham village supply, a 5-inch main is carried to Wykeham Abbey—a distance of 900 yards.

The plant, which has now been in operation for over a year, has quite equalled the author's expectations, having worked constantly without a hitch. For the sake of economy, the engine-house switch is left open when the reservoirs are nearly full, and only closed and pumping carried on when the generating plant is running, thereby avoiding battery losses and saving the battery itself. But, if necessary, the switch may be left closed; and the battery will then operate the pump motor when required, should the engine be not running. The cost of working has been found to be exceedingly low; and although it is somewhat difficult to give exact figures owing to the power being used for electric lighting as well as pumping, the cost of the proportion of energy used by the plant in fuel does certainly not exceed 1d. per 100,000 foot gallons.

The author proceeded to refer to other work on similar lines for which he has been responsible, ending with these among other remarks: The author ventures to think that the problem of using electrical power for pumping the water supply of towns and villages is one which must inevitably come prominently forward in the near future. Many municipalities have gas-works, electric light and tramway stations, water-works, &c., all requiring power in greater or less quantities, and now obtaining their fuel in such a way as to involve the use, in the aggregate, of perhaps two or three miles of railway sidings, and the handling of fuel in comparatively small quantities. It is highly probable that the generation of electric power at some convenient central station, to be used for generating all the power required within a certain radius, will prove far more economical than the plan now followed. The saving in labour must alone prove very appreciable.

Discussion.

Mr. R. S. Lloyd (London) said Mr. Hutton had carried out an exceedingly good scheme in every way. There was no doubt that the application of electric energy was coming in, and very much more largely, for pumping than it had done before. For long distances and high pressures, it was in every way suitable.

Mr. T. R. Smith (Kettering) said it was stated by the author that the high initial cost of the windmill pump led him to consider the electrical one. But there was no reference to the cost of this plant, nor anything as to the efficiency of it. He (Mr. Smith) had lately been making a few inquiries regarding electrical pumping for a matter of 40,000 gallons of water per hour. So far as he could see, the electrical energy represented about 4-horse power, and the horse power of the water delivered about 1¾, which gave an efficiency of about 43 per cent. The question of efficiency in considering electrical pumping had appeared to him to be an important one, and in this way: In the inquiries made and the calculations that followed, it seemed to him that the most expensive plant was the cheapest—that, by the time the usual figures for maintenance and the cost of the current consumed were considered, the most expensive plant was decidedly the cheaper in annual cost, and the efficiency would have been about 67 or 68 per cent. With regard to the cost of the current, this was not given in the paper. It would apparently work out to a little over 1d. per unit. In the machinery he was considering, the cost of the current would have been about 1½d. per unit.

Mr. Hutton said, with regard to the questions put by Mr. Smith, the actual cost of a plant of this description would depend a great deal on how far the electrical energy had to be carried. In this case, the actual cost of the plant did not come out much, if any, less than the cost of a wind-engine. The initial cost might be neglected in this case. Another reason which induced them to adopt this, was that, as the reservoir had only a capacity of 40,000 gallons, and fire-extinguishing was one of the purposes, it became necessary that the pumping supply should be ample and automatic. Regarding the cost of pumping, it would be seen that he gave it as 1d. per 1000 foot-gallons—that was to say, he took the cost of the energy at 1½d. per unit. In practice, he found the plant cost about 1¼d. per unit for all purposes—the 1d. was the cost of fuel, lubricating oil, and so on. The plant, however, was used for other purposes; and so to give the actual figures as to the proportion of the energy used for the pumping plant would be difficult, if not impossible. The cost of energy might be taken as 2d. per unit all round; he thought that could be regarded as pretty generally the cost of electrical energy supply by municipalities throughout the country.

Mr. C. E. Jones understood from the author that this principle of electrical pumping was applicable to larger schemes, on the ground that it was cheaper to convey power than it was to cart coal.

Mr. Hutton replied that, in the majority of cases, it would be; but it would depend upon the distance the coal had to be carried, and also upon the power transmitted, as well as whether the power was used for more than one purpose. If coal cost 8s. or 9s. at the pit mouth, and it cost 8s. or 9s. to carry it (say) 16 or 17 miles, and providing the plant could be kept running on an even load, however big the plant might be, it would be cheaper to run it electrically than to carry the coal the 16 or 17 miles. It was the load-factor that determined the figure.

Mr. R. O. Thompson, the Engineer of the Melbourne Gas Company—who has been a welcome guest at meetings of Gas Managers in England, America, and on the Continent during the last many months—wrote on the 28th ult. from the Hotel Russell: "On the eve of my departure, permit me to express my acknowledgments of the thoughtful kindness and courtesy extended during my visit to the Old Country—indeed, no effort has been spared to make my stay agreeable; and pleasant memories will be cherished and retained on my return to the land of sunshine and gold."

GENERATION OF STEAM BY WASTE HEAT FROM WATER-GAS PLANT.

This subject was dealt with in two papers submitted to the members of the American Gaslight Association at their last annual meeting. The first was by Mr. DONALD M'DONALD, the President of the Kentucky Heating Company of Louisville (Ky.) and was as follows.

With the exception of domestic heating, the generation of steam is practically the only way in which waste heat can be recovered. All other methods either require that the waste heat shall be capable of yielding a high temperature, or they can utilize such a small quantity that they are only available in exceptional cases. Steam is needed in every gas-works, and in its generation heat can be utilized until the source has been cooled to a comparatively low temperature.

Waste heat from a water-gas generator may be recovered from four distinct sources: (1) The sensible heat of the escaping blast products. (2) The chemical energy in combustibles remaining in the blast products. (3) The sensible heat of the escaping water gas. (4) The latent heat of all vapours in the water gas which condense at high temperature.

I shall only endeavour to approximate the quantity of heat which can be recovered from each of these sources, and in order to do this I will make the following assumptions:—

Weight of 1000 cubic feet of enriched water gas	48 lbs.
Specific heat of enriched water gas	·46
Weight of 1000 cubic feet of blast gases	86 lbs.
Specific heat of blast gases	·24
Volume of blast gases per 1000 feet of enriched water gas	2457 c. ft.
Temperature of escaping water gas	1450° Fahr.
Temperature of escaping blast gases	1550° ,,
Temperature to which these gases may be cooled	450° ,,

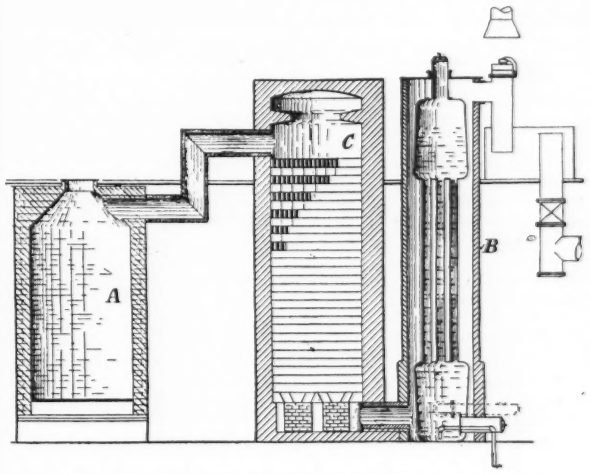
The above assumptions are not absolutely accurate, but they are approximately so.

From the above assumptions, it appears that the heat capable of being recovered for each 1000 cubic feet of enriched water gas made is as follows: From the blast gases, $86 \times 0{\cdot}24 \times 1100 \times 2457 = 55{,}783$ B.T.U.; from the hot water gas, $48 \times 0{\cdot}46 \times 1000 = 22{,}080$ B.T.U.

I have no means of arriving at the quantity of heat set free by the condensation of the vapours in the enriched water gas. It would depend entirely upon the character of the oil used as an enricher; a heavy oil yielding a large quantity, and a distillate yielding a very little. I am also unable to place any value on the heat derived by burning combustibles in the escaping blast gases. My opinion is that the quantity of heat derived from this source is quite large; in fact it is possible to have it too large. If a gas machine is designed and operated in such a way as to generate more carbonic oxide than can be advantageously burned in the superheater, it is evidently a waste, even though this gas may afterwards be burned in the boiler. The whole process, then, amounts to making steam with generator fuel when it might be made far more economically in an ordinary boiler with much cheaper fuel. It must be remembered, however, that even with the best design and the most careful operation, some combustible gas will pass the superheater, and may be advantageously burned in a boiler. Every particle of pitch or lampblack which is deposited on the flues of this boiler will not only yield a great deal of heat in being burned, but its burning will get rid of what is otherwise a nuisance. Bearing the above facts in mind, a boiler to utilize this waste heat should be so designed as to handle the hot water gas, as well as the blast gases, and it should be provided with an air blast in order to burn up such combustibles as are carried by the blast gases or deposited by the hot gas.

It is not right that I should either claim credit for the good points or take the blame for the bad points in our original apparatus for recovering this waste heat. The contractors who planned and constructed our generators provided for a boiler 6 feet diameter and 29 feet high, having a combustion chamber at the bottom, a smoke-box in the top, and 50 6-inch flues 20 feet long expanded into the heads above and below. All the gas and all the blast gases from the machine passed through these flues; a blast being introduced into the combustion chamber for the purpose of burning up anything that was combustible. This boiler made steam rapidly, but in a short time began to leak, owing to the fact that the flues expanded more rapidly than the shell, and therefore worked loose from the top and bottom heads. If these flues had been securely riveted into the heads, I am not certain that they would have caused this trouble, although it is quite likely that they might have broken in two by the continual bending due to expansion with both ends fast. At any rate, the boilers as at first constructed gave so much trouble that after a short time they were changed to the plan shown.

Accompanying this paper is a sketch showing the arrangement of the generator, superheater, and boiler. No attempt is made to show the valves or their fittings. A is the generator, C the carburettor and superheater in the same shell, and B the boiler; the gas passing down through the carburettor and superheater and up through the boiler. It will be seen that the generator affords room for an unusually deep fire. It is not our practice, however, to carry the fuel bed as deep as the generator allows.



ARRANGEMENT OF WATER-GAS SET WITH STEAM-BOILER ADDED.

When it is carried deep, the amount of water evaporated in the boiler is very much greater than when the fire is shallow. The original shell of the boiler was lined with fire-brick, and a complete new boiler, consisting of an upper drum for steam and a lower one for water (the two connected together by the flues) was lowered down into the shell thus formed. In order to provide for expansion and contraction, a small steam dome was put on the top, passing through the top sheet of the shell, and made tight by means of a stuffing-box. There is a man-head in this small dome; and a similar one affords access to the bottom drum.

We have two of these boilers, and they are in constant use during the winter. Each is in practice about equal to an 80-horse power boiler; that is, when the boiler attached to the generator begins to make steam, the fireman in the boiler-house can let down an 80-horse power boiler, and still keep up the required pressure. The apparatus is, however, very far from perfect. It is fairly economical of fuel, but in case one of the flues should begin to leak, it will be necessary to stop making gas in order to caulk it; and in case a flue should split or break, it will be very difficult to repair. I regret to say that there is no separate meter on the supply-pipe which furnishes water to either of these boilers. I am unable, therefore, to give with any degree of certainty the amount of water actually evaporated by them.

Not only does the calculation show that the amount of fuel saved is more than enough to make all the steam used in the original decomposition of the coke, but our experience is that when our ordinary boilers are furnishing the steam for running the blowing engine, the pumps, and the other machinery about the works, the steam pressure will rise, and the work of the fireman becomes much lighter as soon as one of the generators begins actually to make gas and at the same time steam.

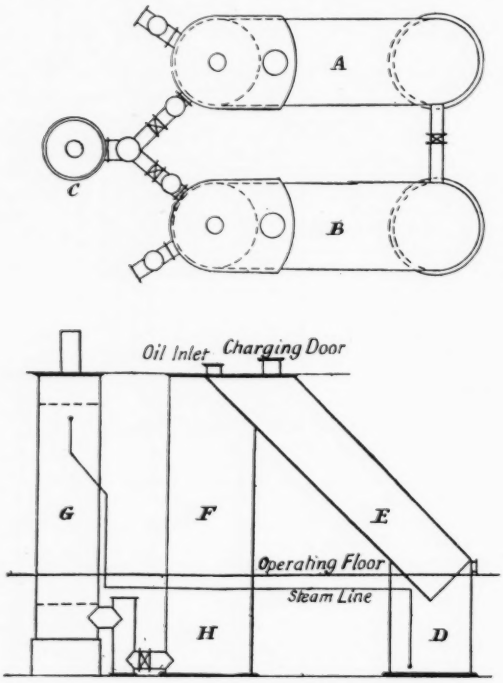
From the figures given at the beginning of this paper, it will be seen that only 22,080 heat units are recovered from the sensible heat of the gas itself. Nevertheless, I think it very desirable that the gas, as well as the blast gases, should be passed through this boiler. The partial cooling of the gas before it reaches the seal is quite an advantage. The depositing out of it of large quantities of heavy pitch and lampblack gets rid of a nuisance; while the heat set free by the depositing of heavy pitch and its subsequent combustion would be lost entirely if the hot gas passed directly to the seal and did not go through the boiler.

Difficulty of repair is practically the only objection which I see to the apparatus as we use it; and I am quite sure that a little skill and ingenuity applied to this subject will produce a boiler which can utilize nearly all the waste heat both in the gas and in the blast gases, which can be bye-passed in case it gets out of order, and every part of which will be accessible for repairs without unreasonable expense.

The second paper was by Mr. A. B. MACBETH, of Kansas City (Mo.), and was as follows:

In connection with Mr. Donald M'Donald's paper on "The Utilization of Waste Heat from Water-Gas Sets for the Generation of Steam," our experience in this line may prove of interest. In one of the works in Kansas City, we have four Rew sets; and it was on two of these that our experiments in generating steam with waste gas were made. In order that the apparatus with boiler attached may be understood, I will briefly describe same.

In the first diagram (a plan of the combination) A and B represent the generators, carburettors, and superheaters; and C represents the boiler. The generators of these two sets are connected together at the bottom, as shown; but a valve, which was kept closed, is installed in the connection. The second diagram (p. 34—an elevation or side view of one set) gives a better idea of the construction. D is the generator, a 9-feet shell with 15-inch linings, its internal diameter being 6 ft. 6 in. E is a



REW SET, WITH BOILER ATTACHED.

retort which performs only the part of a connection between the generator and the carburettor when the set is operated on coke, as it was during this experiment. F is the carburettor, which is in the same shell as the superheater H, and above it; but the chequer-work of one is separated from the other by an arch half way up. The wash-box, stack, and boiler connections are taken off from below the superheater chequers. The boiler is a vertical fire-tube one, 6 feet in diameter, containing 136 4-inch tubes 20 feet long. The inside of the boiler shell at the bottom and the connections to the superheater are all lined. Hydraulic valves are used in connections in between the superheaters and the boiler. The blast inlets are arranged in about the same way as in a standard set, except that we put in an additional 6-inch blast-pipe at the bottom of the superheater below the arch, to act as a boiler blast.

During the test made to determine the number of pounds of water that could be evaporated per 1000 cubic feet of gas made, two sets were operated together, blowing and running alternately, The lengths of runs and blows were each of six minutes' duration. In this way heat was continuously supplied to the boiler; and all steam used in the generators after the sets were heated up was made in the boiler. The fuel used was a good grade of oven coke. The steam line was a 3-inch pipe running from the top of the boiler to the bottom of the generator; but we inserted a disc, $1\frac{3}{4}$ inches in diameter, in order to reduce the amount of steam supplied to the generator when the valve was wide open. This was measured and found to be 36 lbs. per 1000 cubic feet of gas made. The pressure carried on the boiler averaged 25 lbs. No down runs were made; for while it is possible to make these by the use of the connection between the generators, yet it throws one out of use, and therefore causes too much loss of time.

The average results of several days' tests gave an evaporation of 38·9 lbs. per 1000 cubic feet of gas made when only the sensible heat in the waste gases was used, or when our boiler blast was kept closed. The average of several analyses of the escaping blast gases is shown in Table I.; the amount of carbon monoxide contained being 7·36 per cent. by volume.

TABLE I.

	Volume per Cent.	Weight per 100 Cubic Feet.	Weight per Cent.	Specific Heat.
CO	7·36	0·574	0·067	·0166
CO_2	14·61	1·803	0·213	·0462
N	78·03	6·118	0·720	·1756
	100·00	8·495	1·000	·2384

With the 6-inch boiler blast-valve 3-inch open during a part of a day's test, 67·3 lbs. of water were evaporated per 1000 cubic feet, or an increase of 73 per cent. The excess steam produced was allowed to blow off at the boiler safety-valve.

The samples of gas taken at the boiler stack when the blast was used averaged 3·08 per cent. of carbon monoxide, as shown in Table II. From this it appears that only 58 per cent. of it in the waste gases was burned; and it increased the evaporation, as stated, 73 per cent.

TABLE II.

	Volume per Cent.	Weight per 100 Cubic Feet.	Weight per Cent.	Specific Heat.
CO	3·08	0·241	0·028	·0069
CO_2	17·40	2·147	0·249	·0540
O	0·22	0·020	0·002	·0004
N	79·30	6·219	0·721	·1758
	100·00	8·627	1·000	·2371

During a part of one day one set was operated alone, not using the boiler blast, in order to ascertain if it would generate sufficient steam to supply its own generator. This worked very satisfactorily; the water evaporated being 37·2 lbs. The pressure on the boiler, however, dropped during six-minute runs, when no heat was supplied, about 9 lbs.

In addition to the data already given, the following were observed: Blast pressure under generator grates, $12\frac{1}{2}$ to 14 inches; blast head, 4 to $4\frac{1}{2}$ inches; make per set per hour, 33,300 cubic feet; temperature of feed water, 75°; heats by blue glass pyrometer at bottom of superheater, 12 glasses; heats by Le Chatelier pyrometer, 1325° Fahr.; temperature of waste gases at the boiler stack when not using boiler blast, 485° Fahr.; temperature when using boiler blast, 570° Fahr. The boiler was not lagged; and we figured the heat lost by radiation and convection to be 1401 B.T.U. per 1000 cubic feet of curburetted water gas made.

In order to get an accurate average of the analyses of these gases, a great many samples should be collected and the analyses averaged; but several of our sample tubes were broken in shipment to the laboratory. The analyses given therefore do not represent an absolute average analysis of these gases; but they afford us a means, in a general way, of checking our results. If we average the analyses of the samples taken at the boiler stack with no secondary blast going into the boiler, we get an analysis of waste gas as shown in Table I. Assuming that for every 1000 cubic feet of carburetted water gas made 3000 cubic feet of waste gases are produced, we calculate the water we should have evaporated while no secondary blast was on as follows: 3000 cubic feet of blast gas, weighing 8·495 lbs. per 100 cubic feet, and having a specific heat of ·2384 as shown, passing through the boiler lose 840°, and the heat lost will be equal to $30 \times 8{\cdot}495 \times {\cdot}2384 \times 840 = 51{,}035$ B.T.U.

The heat stored in a pound of steam at 25 lbs. pressure is 1163·4 B.T.U. lbs.; but as the temperature of the feed water was 43° above freezing-point, the amount of heat required to raise to boiling-point and evaporate this was 1120·4 B.T.U. Therefore the quantity of water we should evaporate theoretically would be 45·6 lbs. From the total heat units as figured above, however, we should deduct 1401, which we calculate is the amount of heat lost by radiation and convection, which would reduce our total to 49,634 B.T.U.; and this figure divided by 1120·4 would give us 44·3 lbs. per 1000 cubic feet of carburetted water gas made, against an actual evaporation obtained of 30·9 lbs.

In like manner an average of samples of waste gases, when the boiler blast was used, gave us a gas as shown in Table II. When this gas was being used in the boiler, its temperature at the stack was 570° Fahr. The sensible heat given up from this gas, when calculated as before, gives $30 \times 8{\cdot}627 \times {\cdot}2371 \times 755 = 46{,}330$ B.T.U.

As stated before, the waste gas, when no secondary air was supplied to the boiler, contained 7·36 per cent. of carbon monoxide; but when the boiler blast was used, this was reduced to 3·08 per cent.—a difference of 4·28 per cent. In order to calculate the amount of heat produced by this combustion, we must find the total weight of carbon monoxide burnt to carbonic acid in this 3000 cubic feet of gas, and multiply by the heat of combustion per pound, or 4325 B.T.U., which gives 43,371 B.T.U. Adding this figure to 46,330, the sensible heat given up, we get a total of 89,701 B.T.U., less 1401 B.T.U. loss by radiation and convection, or 88,300 B.T.U. Now, dividing this as before by 1120·4, we get 78·8 lbs. of water evaporated per 1000 cubic feet of gas, compared with 67·3 lbs. actually evaporated.

As previously stated, the sets on which these experiments were made are of the Rew pattern, and are not the most efficient form of apparatus. In order, therefore, to figure what saving could be effected on a modern double superheater 8 ft. 6 in. set by using its waste gases to generate steam, I give some observed data and deductions from them: Average of carbon monoxide in the escaping blast products, by analysis, 5·90 per cent.; average temperature of escaping blast products, by Le Chatelier pyrometer, 1050° Fahr. Assuming that the temperature of the waste gases could be reduced, by passing through a boiler, to 485° Fahr., that we produce 3000 cubic feet of waste gas per 1000 feet, weighing 8·6 lbs. per 100 cubic feet, with a specific heat of ·236, and that by the introduction of the secondary air we could burn 80 per cent. of the carbon monoxide in this gas to carbonic acid, and considering 85 per cent. of the heat as available, then the heat available per 1000 cubic feet of carburetted water gas is as follows: Sensible heat, $30 \times 8{\cdot}6 \times {\cdot}236 \times 565 = 34{,}402$ B.T.U.; heat produced by burning carbonic oxide, $3000 \times {\cdot}0472 \times 0{\cdot}0781 \times 4325 = 47{,}830$; giving a total of 82,232. Now, 85 per cent. of 82,232 total B.T.U. = 69,897; and this divided by the number of units required to produce 1 lb. of steam at 110 lbs. pressure from water at 75° Fahr., which is 1143·9 B.T.U., gives us $69{,}897 \div 1143{\cdot}9 = 61{\cdot}1$ lbs.

With boiler fuel at $2 per ton, or 0·1 c. per pound, and using 16 pounds per 1000 cubic feet of gas made, and figuring that 100 lbs. of steam per 1000 feet are required in a plant to operate an 8 ft. 6 in. set, making 900,000 cubic feet per day, an equipment of this character would save in fuel alone, not considering labour, $8·80 per day, or 0·98 c. per 1000 cubic feet. In addition to this, we might also pass the carburetted water gas through the boiler, utilizing its sensible heat. The temperature of this gas we found varies from 1150° to 900° Fahr., or an average of 1025°; and this could be reduced to 425°—a reduction of 600°. In order to figure the heat to be extracted from 1000 cubic feet of gas by this reduction in temperature, we must multiply its weight by its specific heat and by the temperature difference: 48·29 × ·4579 × 600 = 13,267 B.T.U. Considering 85 per cent. of this heat as being available, we get 11,277 B.T.U. This, figured as before, will evaporate 9·9 lbs. of water, which added to 61·1 lbs. equals 71 lbs. If figured as before, this will produce a saving of 71 × 1·6 × 900 = $10·22 per day, or 1·14 c. per 1000 cubic feet of gas made.

DISTILLATION OF COAL BY MEANS OF HIGHLY-HEATED GAS.

It has often been pointed out that the carbonization of coal in gas-retorts at the present day is subject to the imperfection that the requisite heat for the process has to be transmitted through walls which conduct heat badly. Moreover, at the temperature to which the retorts are raised the heavy illuminating hydrocarbons and ammonia are liable to decomposition whenever they come in contact with the walls of the retorts. Bearing in mind, also, the fact that Tervet showed in 1884* that the whole of the nitrogen in coal could be recovered as ammonia if the coal were carbonized in a current of hot gas, consisting wholly or mainly of hydrogen, whereas on a gas-works only 13 to 15 per cent. of the nitrogen is so recovered, it has seemed desirable that the idea of carbonizing coal in, and by means of, a current of heated gas should be followed up. This idea underlies Besemfelder's process for making a mixed coal-water gas, to which reference has been made from time to time in the "JOURNAL;"† and lately Herr E. Blass, of Essen, has reported some experiments which he has carried out with a view to elucidating it. The following account of these experiments is abstracted from the "Journal für Gasbeleuchtung," and is supplemented from the same source by the substance of a further communication by Herr E. R. Besemfelder, of Charlottenburg.

Herr Blass filled with gas coal a vertical iron cylinder, which was placed within an outer cylindrical vessel containing zinc. The annular space was also traversed by a worm connected at one end to a supply of coal gas or water gas, and at the other end with the top of the inner receptacle containing the coal. The zinc was maintained, by external gaseous firing, in a state of fusion; and gas was passed through the worm, where it attained the temperature of the molten zinc, into the coal receptacle, whence it passed out along with the gaseous products evolved from the coal. It was first proved that coal gas suffered no loss of illuminating power when passed through the apparatus with the coil heated to about 900° C., which is the temperature of boiling zinc.

Then 10·58 oz. of coal was put into the inner receptacle, and distilled for about 1½ hours by passing through it 22·46 cubic feet of hot water gas; the temperature of the zinc bath being from 672° to 705° C. The residual coke amounted to 68 per cent. of the weight of the coal; and allowing 10 per cent. of ash, the residual carbon would be 61 per cent. Converted into water gas, the residual carbon would yield about 20·8 cubic feet of water gas per pound of coal carbonized in producing the coke; whereas the volume of water gas required to carbonize a pound of coal would be 16 × 22·46 ÷ 10·58 = nearly 34 cubic feet. Consequently, the water gas obtainable from the residual coke would have to be passed through the coal about twice in order to complete its carbonization. The yield of ammonia was equivalent to about 29·1 lbs. of sulphate per ton of coal carbonized, which is an increase of about 62 per cent. over the gas-works yield. The apparatus used did not admit of the temperature being much higher than 700° C.; otherwise a larger yield of ammonia might have been secured, as Tervet has shown that complete recovery of the nitrogen as ammonia is only attained at from 900° to 1000° C. (red heat). The gas resulting from the distillation (*i.e.*, the mixture of coal gas and water gas) burnt with a luminous flame for about two-thirds of the time of distillation. Hence the water gas which was rendered illuminating amounted to about 22·4 cubic feet per pound of coal, or over four times the yield of coal gas per pound of coal, which is about 5·34 cubic feet under gas-works conditions. Thus a pound of coal suffices to carburet 22·4 cubic feet of water gas, and yields 0·68 lb. of coke, which again would yield nearly that volume of water gas. It is true the mixed gas would have a lower illuminating power than the coal gas. But the experiment demonstrates that the distillation by hot gas gives a greater yield of illuminating hydrocarbons from the coal than is obtained in gas-retorts; and so long as the gas is luminous in flat-flame burners, it is unnecessary to require greater illuminating quality, since without that it can perfectly replace coal gas for incandescent lighting, heating, cooking, and power purposes.

It may be calculated from thermic data that, assuming the water gas enters the coal receptacle at 1000° C. and leaves it at 300° C., the heat given up will not suffice to effect the complete carbonization of the coal if the water gas obtainable from the residual coke only is passed through the coal but once. According to Herr Blass, both his own experiments and gas-works practice have shown that from 300 to 350 calories are required for the carbonization of a kilogramme of coal (= 540 to 630 B.T.U.'s per pound).

Herr Besemfelder points out that Herr Blass, in his calculations, has left out of account the sensible heat of the "blow" products of the water-gas process, and the volume of these "blow" gases, which are, equally with the water gas, derived from the coke obtained from the coal. The quantity of heat represented in these gases is very large; and it is by utilizing it that a uniform mixed gas can be continuously produced according to Besemfelder's process. The sensible heat of the blow gases aggregates fully double as much as that of the water gas made. Herr Blass has put the sensible heat of the water gas (issuing from the generator at 1000° C.) at 160 calories for the amount of coke resulting from a kilogramme of coal; and if the sensible heat of the corresponding volume of blow gases is added, the total becomes about 480 calories. But as the blow gases cannot be applied directly to heating the coal, because their admixture with the gas produced would deteriorate its quality, allowance must be made for the loss, through the heat from the blow gases having to traverse fire-brick walls. Assuming, therefore, that only half the heat of the blow gases is utilized, the total becomes 320 calories, which, according to Herr Blass, is about the heat required to carbonize a kilogramme of coal.

But if the coke from the gas-retorts is passed without cooling or quenching into the water-gas generator, only one-half of it is needed to supply the heat required to carbonize the coal. The coal may be carbonized merely by the sensible heat of the gases from the water-gas generator; and no coke need be used in retort-furnaces. The earlier papers by Herr Besemfelder have shown that his gas-making process fulfils the conditions in question. One feature of it is that the coal comes in contact with the water gas at about 1000° C., in a most advantageous manner for the extraction of the nitrogen to form ammonia; and it has been shown by Tivet and others that this extraction and recovery are complete at that temperature. The calculations made in earlier papers as to the yield of ammonia by Besemfelder's process assumed that it would be only 60 per cent. of the theoretical maximum; and Tivet's researches have indicated that this yield can be easily attained in such a manner.

* See "JOURNAL," Vol. XLIII., p. 403.

† Vol. LXXIX., pp. 146, 207, 276; and Vol. LXXXVI., p. 95.

Professor Nichols on Photometry.

At the congress of electricians held at St. Louis during the International Exhibition, Professor Edward L. Nichols called attention to the standards of light; declaring that in photometry we have at last abandoned the futile attempt to standardize the actual candle. He pointed out that though it still stands in law as our unit of illumination, the search for a practical standard of light is limited (1) to the use of a standard flame, (2) of an incandescent body of fixed temperature, and (3) of a luminescent body. He stated that the only fuel of strictly definite composition which it has been found possible to subject to constant conditions of combustion, is amyl-acetate. It has been found that with lamps constructed strictly of the prescribed dimensions and materials, and used under normal conditions of atmospheric pressure and moisture, it is possible to reproduce the same illuminating power to within 2 per cent. This performance so far exceeds in uniformity that of any other available photometric standard, that the Hefner-Alteneck amyl-acetate unit has been adopted as the best primary standard, in spite of the fact that the quality of the flame is such as to interfere seriously with satisfactory comparisons between it and the whiter and brighter sources of light used in modern illumination. With respect to acetylene, Professor Nichols admitted that it has been found impossible to devise a reproducible standard, or even produce a form of burner which will remain of approximately constant intensity from day to day. Coming to incandescent solids, such as the Welsbach mantle, the electric glow lamp, and the Nernst lamp, he found in each of them very great difficulties that must prevent them, for the present, from becoming primary standards of light.

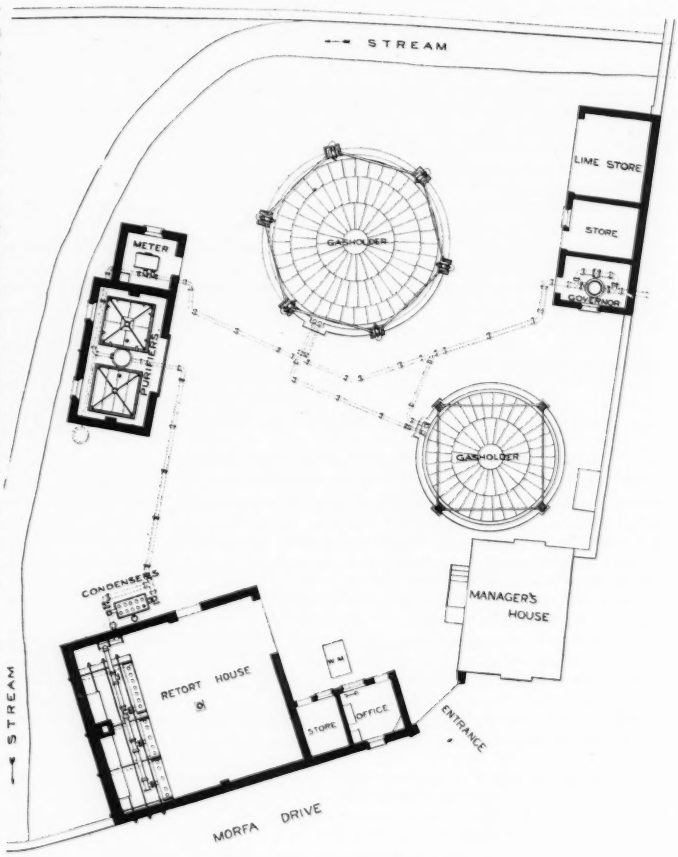
The British Fire-Prevention Committee have published the results of a series of tests made with the object of determining the safety of a new form of lamp to burn petrol, manufactured by Petrolite, Limited, London. In the lamp in question air is carburetted continuously by passing through absorbent non-combustible material saturated with petrol; the carburetted air being then burnt under an ordinary mantle. The lamp was forcibly overturned, and rolled about on inflammable material without danger; and it is reported to have withstood numerous other tests satisfactorily.

CONWAY CORPORATION GAS-WORKS.

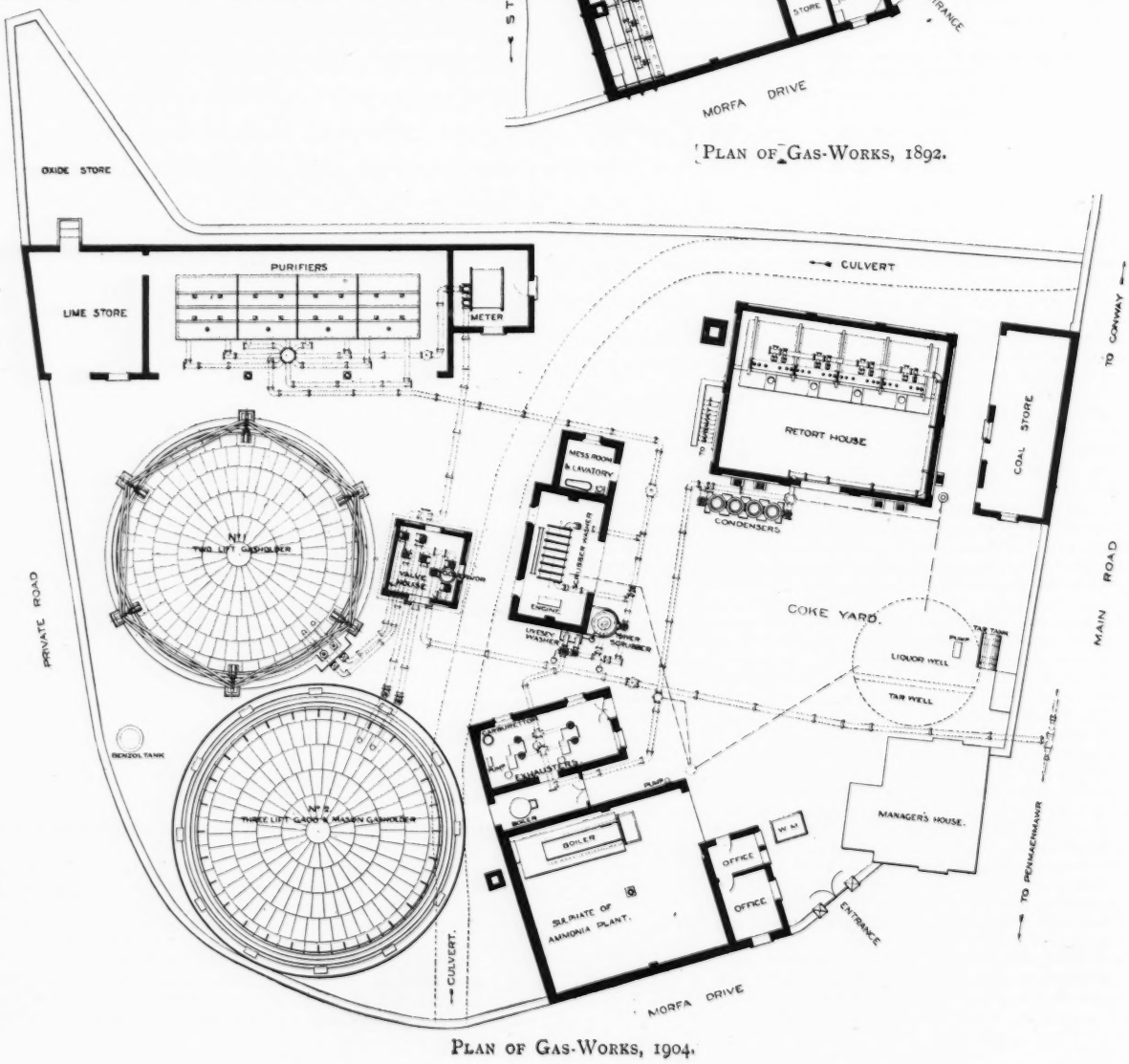
In 1880, the Conway Corporation purchased the gas-works from the Gas Company. At that time, the works were producing under 2 million cubic feet of gas per annum; but during the following ten years the demand increased by 150 per cent., so that in 1890—when the consumption had increased to 4½ million cubic feet per annum—the resources of the works were taxed to the uttermost. In 1892, Mr. T. B. Farrington, of Llandudno, who was then Engineer to the Conway Corporation, advised the installation of a steam-engine and rotary exhauster, with a vertical boiler to supply steam for same, a Livesey washer capable of pasing 100,000 cubic feet of gas per day, a cast-iron tower scrubber, 4 feet diameter by 35 feet high, filled with boards, and a 9-inch station governor with bye-pass. This apparatus was accordingly put down. The following year it was found necessary to increase the storage capacity; and a telescopic gasholder—with outer lift 50 feet diameter by 16 feet deep, and inner lift 48 feet diameter and 16 feet deep—was erected in a concrete tank built for the purpose. When the holder was completed, it was found advisable to pull out the smaller of the two old holders; and when this was done, the tank was covered over with a joist-and-concrete roof, making it into a tar and liquor storage tank, and increasing the yard room.

For seven years, these additions to the plant were found to be sufficient; but at the end of this period the Corporation, acting on the advice of Mr. Delamotte (who had succeeded Mr. Farrington), built a new boiler-house and chimney, and laid down a Cornish boiler 22 feet long by 6 feet diameter just outside the old retort-house.

By the year 1902, the consumption had increased to 13 million cubic feet per annum, and great trouble was experienced in meeting this demand. Again acting on Mr. Delamotte's advice, the Corporation made large structural alterations. The second of the two old



PLAN OF GAS-WORKS, 1892.



PLAN OF GAS-WORKS, 1904.

holders was pulled out, and a new retort-house was built on the site; the tank being partly filled in, and also enlarged to form the subway. In this house, a retort-bench was built containing four arches of six retorts each, on the deep regenerator principle, complete with all mountings, and foul-main carried round the walls of the house. Four annular atmospheric condensers were erected just outside the house, the foundations for which were carried up from the bottom of the old tank. The exhauster-house was enlarged to about twice its original size; and a new steam-engine and rotary exhauster capable of passing 10,000 cubic feet of gas per hour were installed in addition to the old exhauster. A new lime-shed, purifier-house, and meter-house were put up in one corner of the works. The lime-shed built at one end was an enclosed brick building about 24 ft. by 21 ft. 6 in. The purifier-house in the centre was built of brick on three sides, 60 ft. long by 24 ft. wide, with an open front; the roof being supported on cast-iron columns and rolled-steel joists. The meter-house, 15 feet square, adjoined the purifier-house, at the opposite end to the lime-shed. Rolled-steel joists were built into the gable end of the meter-house, so that at any time an opening 10 feet square could be cut out without propping, to take out the meter. The whole building was covered with a suitable steel roof and corrugated sheeting and a ventilator formed over the purifier-house for about three-quarters of its length. Four new purifiers 12 ft. square by 5 ft. deep on Green's system, and worked by means of a 9-inch centre valve and connections, were erected in the purifier-house, and a new station-meter capable of passing 15,000 cubic feet per hour was laid down in the meter-house. The old purifier-house was then dismantled; the purifiers being taken out, and a new washer-scrubber capable of dealing with 250,000 cubic feet of gas per day put in their place. The old meter was also taken out and the house redecorated and made into a mess-room for the workmen.

These contracts were completed in 1903; and twelve months later it was again found necessary to increase the storage capacity. To make room for the new gasholder, the boiler-house was pulled down and the Cornish boiler removed and reset in one corner of the old retort-house, which is also being used at the present time as a coal-store. A new governor-house has been built, containing a 12-inch governor and distributing pipes with all valves inside this house, so that the gas can be stored in, or taken out of, either holder. The yard connections are also being re-arranged, and a steel tank, 55 ft. 6 in. diameter by 20 ft. 6 in. deep, containing a three-lift gasholder 50 ft., 52 ft., and 54 ft. diameter by 20 ft. deep each lift, is also in course of construction. These contracts are now nearing completion.

Thus in a very short period of time, the old gas-works have disappeared, and a modern, efficient, and effective plant has replaced it. Mr. Dixon, the Works Manager, who has supervised the later contracts, now finds that he can make with ease about 500 cubic feet more gas, sell 2½ cwt. more coke, and obtain 6 gallons more liquor (10 per cent.) per ton, than he could from the old plant before the new retort-house and other alterations were carried out in 1903.

The whole of the contracts mentioned above were carried out by Messrs. Robert Dempster and Sons, of Elland, who thus add another name to the already large list of complete gas-works erected by them.

Mr. CHARLES FAIRWEATHER has been appointed Joint Manager with his father of the Kilmarnock Corporation Gas-Works.

Mr. J. FYFE DONALD, J.P., ex-Provost of Johnstone, who died recently, took a prominent part in securing the gas-works for the Corporation. He was associated with the iron trade, and for many years was an active member of the Town Council.

At the Michaelmas examination of the Cambridge University, Mr. C. E. A. ARMITAGE, B.A., of Emmanuel College, Cambridge, and St. Bartholomew's Hospital, London, eldest son of Mr. Charles Armitage, of Lancaster, passed his final examination for the degrees of Bachelor of Medicine and Bachelor of Surgery.

Mr. LAWRENCE V. WHITAKER, Assistant-Manager of the Wakefield Gas Company, has been appointed Manager of the Pontefract Gas Company, in succession to the late Mr. W. Gundill. In connection with this appointment we are asked to mention that the vacancy created by it at Wakefield has been filled up.

Christmas Eve saw Mr. CORBET WOODALL safely home again after his visit to South Africa. The journey was taken purely for professional purposes; but Mr. Woodall's numerous friends will be gratified to learn that the voyage has had a very salutary effect, and that Mr. Woodall is, in consequence, looking and feeling remarkably well.

Most readers are aware that Mr. F. S. Cripps has made a special study of the subject of the flow of gas. He has already considered it in relation to proportioning mains, and has lately been directing attention to it in connection with passages in gas apparatus, openings in plates, valves, &c. The result has been the formulation of three useful rules, which will be found in an article by him which appears on p. 30 of the present issue of the "JOURNAL." The rules are accompanied by several examples, as well as by a table of constants which Mr. Cripps has compiled. We are so impressed with the utility of this table, that it is intended to have some copies printed on stout paper, and one will be sent unfolded to any subscriber on the receipt by the Publisher of 2d. in stamps.

DETERMINATION OF SULPHUR IN GAS.

At the Annual Meeting of the American Gaslight Association, Mr. W. B. CALKINS, the Chief Chemist to the Laclede Gas Company of St. Louis, read the following paper descriptive of a rapid method for the determination of the total sulphur in gas.

From time to time different methods have been offered for determining the total sulphur in gas. The best of these are easy of manipulation and very accurate; their only drawback being the length of time necessary to run them before a determination can be obtained. The method here offered has been studied for the purpose of combining rapidity of operation with accuracy of results; and so far the analyses obtained from illuminating gas have shown as great accuracy as those made on a standard gas containing a known quantity of sulphur.

The method depends upon the well-known chemical fact that sulphur compounds such as carbon bisulphide, mercaptan, and other organic forms, break up and form sulphuretted hydrogen when mixed with free hydrogen and passed over heated platinized asbestos or pumice. After the sulphur compounds have been changed to the form of sulphuretted hydrogen, it is a very simple matter to precipitate the sulphur in some form easily weighed or titrated and the percentage of sulphur figured back as grains of total sulphur per 100 cubic feet of gas. In order to have the analysis as rapid as possible, gravimetric methods were not considered, but the well-known titration process with a standard iodine solution was employed.

The iodine method chosen is the one commonly used for the rapid determination of sulphur in pig iron and steel, and consists in absorbing or precipitating the sulphur evolved as sulphuretted hydrogen, in solutions of sodium or potassium hydrate, or in an ammoniacal solution of cadmium or zinc chloride. The use of the two latter is to be preferred, on account of the sulphur being in a visible form (CdS or ZnS), and one which is not liable to alteration on standing.

The reaction that takes place when sulphuretted hydrogen is run into a strongly ammoniacal solution of cadmium chloride is as follows:—

$$H_2S + CdCl_2 + 2NH_4OH = CdS + 2NH_4Cl + 2H_2O.$$

Now, if the solution containing the precipitate of CdS is diluted with a large volume of cold distilled water and a sufficient quantity of hydrochloric acid added, sulphuretted hydrogen is set free by the following reaction:—

$$CdS + 2HCl = H_2S + CdCl_2.$$

A considerable excess of hydrochloric acid is needed to effect a complete reaction, and the volume of water present must be large and cold in order to prevent the escape of any sulphuretted hydrogen. The solution of sulphuretted hydrogen in water is now titrated with a standard iodine solution, using a little fresh starch solution as an indicator. The reaction is as follows:—

$$H_2S + 2I = 2HI + S.$$

The least excess of iodine is shown by the intense blue colour (iodide of starch) that is instantly formed as soon as the reaction is complete.

The solutions needed are a standard solution of iodine, a fresh, clear solution of starch, and a strongly ammoniacal solution of cadmium or zinc chloride. No arbitrary standard solution of iodine is needed, but to suit local conditions one can be made up, the preparation and standardizing of which will be found fully explained in any good book on quantitative analysis. For the cadmium chloride solution, a good strength for the stock bottle is made by dissolving 4 grains of cadmium chloride in 100 c.c. of water, and when dissolved adding an equal volume of strong chemically pure ammonia.

The platinized asbestos for filling the combustion tube is easily prepared by taking ¼ lb. of clean asbestos wool, free from sulphur, washing it in 2 oz. of a 5 per cent. solution of platinum chloride, and then drying and placing it in a large evaporating dish. The operator should separate the wool, moisten it evenly with alcohol, and then ignite it. This forms a coating of platinum black over the wool fibres. The wool must now be strongly heated in order to drive off any free acid.

The apparatus needed for this method consists of a good meter—one that will accurately measure 0·1 of a cubic foot (or in place of it a good meter prover can be used, and the sample of gas it contains taken to represent the average gas made for several hours); a small 15-burner combustion furnace; some good Jena glass combustion tubing 30 inches long, or a flanged porcelain tube, glazed inside, of the same length and 0·5-inch internal diameter; four plain ringed-neck glass cylinders 9 inches high, to hold about 150 c.c., with 2-holed rubber stoppers to fit; a small brass aspirator filter-pump; and several feet of good glass and pure-gum rubber tubings for making connections.

Before starting the test, the meter and combustion tube must be filled full of the gas to be tested, and the gas shut off; then the combustion furnace heated up, slowly at first, so as not to crack the combustion tube, until this is a dull red (about 1000° to 1200° Fahr.). The operator should now read the meter and turn on the gas, and by means of the aspirating pump draw the gas through the loosely packed combustion tube, connected to a delivery tube which reaches almost to the bottom of the first receiving cylinder, then through a second cylinder and out through the aspirating

pump, which is attached to the water service. By means of the pump the gas can be drawn at any required speed through the apparatus, but faster than 0·5 cubic foot per hour is liable to cause the cadmium chloride solution to bubble out of the first cylinder into the second. The latter is used as a guard in case any sulphuretted hydrogen might pass the first cylinder. Both are filled with solution of the same strength; 3 c.c. of the strong cadmium solution is added to each cylinder, then about 10 c.c. of strong ammonia, and then the cylinders are filled with distilled water to a depth of about 7 inches. When the required volume of gas has been passed, the meter and aspirating pump are shut off, the cylinders disconnected and washed out with a large volume of cold water into a deep cylindrical beaker, a few cubic centimetres of starch solution added, and then a large excess of concentrated hydrochloric acid added. Without much stirring at first, titrate with the iodine solution as rapidly as possible, adding it until the last drop changes the opalescent liquid to a deep blue, which does not disappear on standing for two or three minutes. There must be no delay in titrating, for if the solution containing the cadmium is allowed to stand, it will lose sulphuretted hydrogen or the sulphide may oxidize.

Another method is to quickly filter off the flocculent precipitated cadmium, place the filter and the precipitate in a deep beaker containing a large volume of cold water, add the hydrochloric acid and starch solutions, and then titrate. This avoids the presence of a large amount of ammonium salts and any hydrocarbons absorbed in the liquid, with which it has been claimed iodine reacts slightly. The combustion tube must be loosely packed from time to time with fresh platinized asbestos, for the old will gradually be coated with carbon, and the tube stopped up.

To prove that the chemical reaction is complete, known quantities of carbon bisulphide and mercaptan were vaporized with pure hydrogen gas. This mixture was passed through the apparatus, the sulphuretted hydrogen precipitated with cadmium chloride, and the amount of sulphur determined by standard iodine solution. The quantity found agreed with the percentage of sulphur contained in the organic sulphur compounds. Other tests for accuracy were made by comparing results obtained from the same sample of gas by determining the percentage of the total sulphur present—first with the London Gas Referees' sulphur apparatus, and then by the combustion method; and the results agreed very closely. The following are a few of the results, in grains per 100 cubic feet:—

No of Analysis.	Referees' Method.	Combustion Method.
I.	14·512	14·530
II.	16·224	16·320
III.	15·820	15·980
IV.	18·256	18·724

Correction for temperature and pressure must be made as in any gas analysis.

Engineers and the Possession of Plans.

A controversy of some interest has arisen between the Paignton District Council and Mr. F. W. Vanstone, the Engineer for the new water-works which the Council are constructing on the border of Dartmoor. As the result of the recent discussion upon the increased cost of their water undertaking, the Council applied to Mr. Vanstone to deliver the sealed contract drawings to the Clerk, in order that they might be placed in safe custody at the offices of the Council. In reply, Mr. Vanstone wrote that by the aid of these drawings the final award and settlement between the respective parties to these contracts would eventually have to be made; and for this purpose, he submitted, they should continue to be held by himself until the completion of the works. The drawings had always been available to the Council for reference, explanation, or any other purpose, whenever they required them. He was using or referring to the drawings almost every day in the carrying out of the works, more especially now, while engaged in the preparation of plans and estimates in connection with the proposed Local Government Board inquiry respecting the application for additional borrowing powers. When the letter was read at a meeting of the District Council yesterday week, Mr. Gadsden said he was not prepared to accept the explanation, which they did not ask for. They applied for the drawings to be lodged with the Council; and he moved that Mr. Vanstone be informed that unless this was done in 24 hours, the Council would take steps to enforce compliance. The Chairman (Mr. F. W. Puddicombe) said he was previously of opinion that the drawings should be in the hands of the Council; but, having had an interview with Mr. Vanstone, he no longer thought so. Mr. Vanstone argued that the drawings should be in the hands of a disinterested party quite distinct from the Council and the Contractors, and further that, as he was Arbitrator between the two parties, the plans should be in his possession. They ought to have had them in duplicate from the beginning. Mr. Gadsden contended that Mr. Vanstone had set the Water Committee at defiance. The motion requiring delivery of the plans in 24 hours was lost; but it was decided to request Mr. Vanstone to keep them in a fire-proof safe.

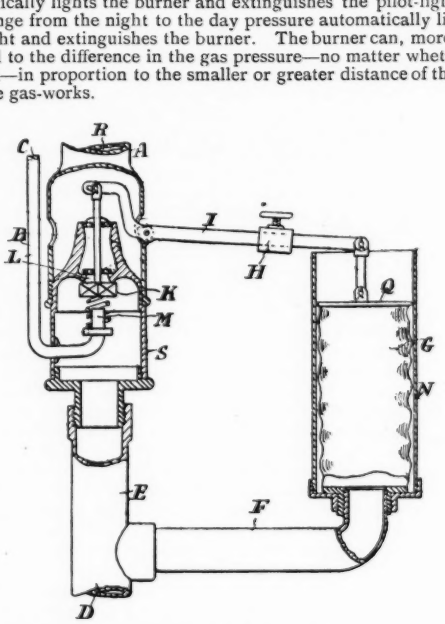
REGISTER OF PATENTS.

Manufacture of Coal Gas.—Johnson, J. Y.; a communication from the Deutsche Continental Gas Gesellschaft and Julius Bueb, of Dessau, Germany. No. 1393; Jan. 19, 1904.

This invention, relating to the manufacture of coal gas in vertical retorts, is referred to elsewhere to-day, p. 28.

Gas-Burner with Lighting Attachment.—Nielsen, C., of Copenhagen. No. 25,699; Nov. 24, 1903.

This invention relates to gas-burners so arranged that the change from the lower pressure in the day-time to the higher pressure at night automatically lights the burner and extinguishes the pilot-light; while the change from the night to the day pressure automatically lights the pilot-light and extinguishes the burner. The burner can, moreover, be adjusted to the difference in the gas pressure—no matter whether large or small—in proportion to the smaller or greater distance of the burner from the gas-works.



The improvements consist (as shown) in a double-seated valve for controlling the two gas inlets to the burner and the lighting attachment—one or more springs acting upon this double-seated valve in different manners; a small gas-storage vessel made of gas-tight, inextensible, and gas-proof material; an unequal armed lever system connecting the gas-storage vessel with the double-seated valve; and means for regulating the load on the lever system. D is the gas-tube, which is bifurcated into the upper tube E, and the branch tube F leading to the storage vessel G. The tube E terminates in a gas-chamber, in which a double-seated valve K is arranged to move up and down for opening the inlet M to the lighting attachment B and closing the inlet L to the burner, or *vice versâ*. The inlet is formed in a bell secured in a convenient manner in the tube S. Above the bell the tube is provided with several air holes for the admittance of fresh air; so that the tube R serves as a mixing tube or chamber. On the upper end of the branch tube a casing N is fastened, which encloses the storage vessel G, made of fish-bladder, silk with a gas-tight enclosure leather, or of other pliable or elastic but inextensible material, and provided with a weight-plate G pivotally connected with a lever I. The lever is fulcrumed at the tube S, and its internal slotted arm is hinged to the rod of the double-seated valve K—this rod being guided in suitable holes of the two grids on the bell.

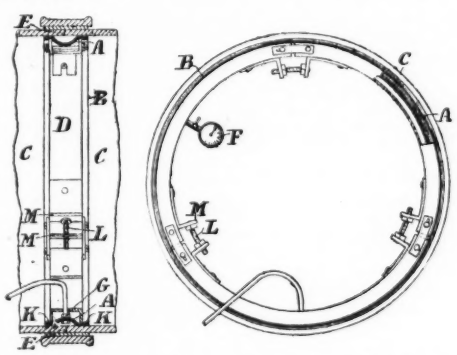
The gas pressure in the day-time being smaller than at night, the storage vessel G is collapsed during the day, but extended by filling with gas at the change from the day to the night pressure. The filled vessel G will then move the lever I upward, and its internal arm downward, to detach the double-seated valve K from its upper seat L—*i.e.*, the inlet for the burner A—so that the gas is allowed to pass from the gas-tube D E to the burner, while being mixed with fresh air in the mixing-tube R. The gas mixture escaping from the burner is ignited by the pilot-light C. Two springs are inserted between the double-seated valve K and a shoulder on the lighting-tube B. The springs are superposed by a disc, and the upper spring is made weaker than the lower one; so that on moving the valve K downwards it will first compress the upper spring and bear on the upper rim of the disc before it can compress the lower spring and close the inlet M to the lighting attachment. In a similar manner, on the lever I being released, the lower spring will first extend and raise the disc, thus opening the lower inlet M, but without closing the upper inlet L. Only on the pressure of the gas in the vessel G being sufficiently lowered will the upper spring be able to close the upper inlet and thus extinguish the flame on the burner. This means that the change from the pilot-light C to the burner light, and *vice versâ*, will always be effected gradually, so that the gas escaping from the burner will have time to ignite itself on the pilot-light C, in the same way as the gas escaping from the lighting attachment will be ignited by the burner light with certainly before the burner light is extinguished.

The collapse of the storage vessel G at the change from the night to the day pressure is effected by the weight-plate G, and also by means of an adjustable weight H on the lever I; this taking place gradually, so that first the upper inlet L is left open to allow the gas escaping from

the lighting tube B to ignite itself on the burner light before the latter is extinguished by the closure of the inlet L by the valve K. The motion of the weight plate Q is transmitted on the valve K by an unequal armed lever system, which multiplies the force of the inner pressure of the storage vessel G in its effect on the valve.

Testing the Joints of Pipes.—Glover, J., of Newton-le-Willows. No. 1399; Jan. 19, 1904.

This invention relates to an appliance for testing the joints of pipes, in order to ascertain whether they will stand, without leaking, the necessary fluid pressure at the joint, when in use. This consists firstly in providing inside the pipe at, and in communication with, the pipe joint, a circumferential channel which, in conjunction with the inside of the pipe, forms (provided the joint be not a defective one) a fluid-tight chamber, and, secondly, filling or inflating this channel with water, air, or other fluid, at high pressure. If after the lapse of a certain time after inflation, it is ascertained, by means of a pressure-gauge, that the pressure in the chamber is maintained, it proves that no leakage takes place through the joint, and that the latter will stand the necessary pressure inside the pipes so soon as they are put into use. If, however, the air pressure in the chamber is not maintained, it indicates that leakage at the joint is taking place, and that the joint is consequently defective.



The annular channel A in this illustration may be a complete ring, or else built up in segments, and may be formed of rubber, or other suitable material, firmly clipped at the two edges B in a water-tight and air-tight manner to the inside periphery of the pipe C. The intermediate space, which is left free, is inflated with water at a somewhat higher pressure than that of the fluid to be carried within the pipe, or it can be an annular piece of metal D or other material of channel section, with rubber or other material at its edges to form a water or air tight joint against the inside surface of the pipe at each side of the pipe joint. Whichever arrangement is adopted, an annular cell is formed all round the pipe inside; and this cell is inflated with fluid at a high pressure. Thus the only way the fluid can possibly escape is through the pipe joint. If the pipe joint be defective, the fluid in the cell will escape that way, and a reduction of the pressure in the cell will at once indicate the fact on the pressure gauge F; but if the joint be a perfect one, the pressure in the cell remains at full pressure. The annular strip A or ring of rubber can, intermediate between the edges, be made in channel section before being placed *in situ*, so as to form a cell for the fluid under pressure, or it may be made flat in cross section, and the air inflation be relied upon to swell the latter into an annular channel between the edges, if the valve G is provided together with a pipe for inflation and deflation.

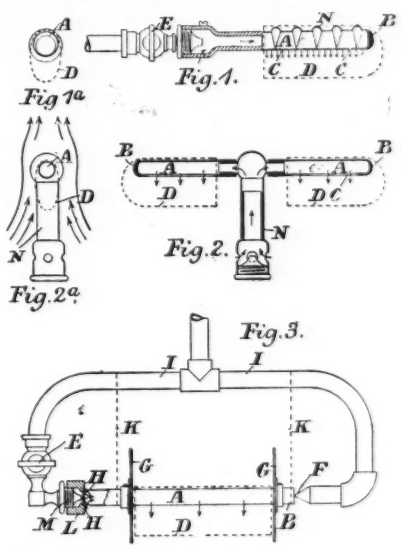
There are several ways in which to clip the edges of the rubber ring or channel on the inside of the pipe. In the arrangement shown, a channel iron D made in segments is provided, which is placed on the rubber ring so that one of its ribs will press one edge of the rubber against the pipe at one side of the pipe joint, and the other rib press the rubber against the pipe on the other side. There would also be shoulders K on the rubber ring, against which the ribs of the channel abut, so as to prevent the ring getting displaced. Then, by means of screws L or wedges or other devices, preferably acting on angle-pieces M on the segments, the ribs of the channel D will press the edges of the rubber ring firmly against the pipe and produce a joint through which no fluid can escape.

The mode of action is as follows: When a line of piping has been laid and the joints formed, the air-tight cell is arranged inside the pipe in the manner described. This is inflated by a pump (not shown) at high pressure—somewhat higher, in fact, than that of the fluid to be carried within the pipe. When the inflation is completed, an examination of the pressure-gauge from time to time will at once indicate the fact whether or not the pressure in the cell is maintained. The cell can, of course, be filled with fluid at high pressure other than water (such as air) if desired; but water is found preferable, owing to the facility with which leaks can be detected.

Generating Incandescent Gas-Light.—Hudler, J., of Glauchau, Saxony. No. 1696; Jan. 22, 1904.

The known methods of, and apparatus for, the generation of incandescent gas-light possess in common (the patentee remarks) the feature that the bunsen flame which heats the incandescent mantle is directed longitudinally through the incandescent body, the contact of the point of the flame with the incandescent body being avoided. In order to obtain even incandescence of the mantle in this way, it is necessary to endeavour (1) To shape the bunsen flame as nearly as possible to the shape of the mantle, or, conversely, to make the shape of the mantle fit that of the flame, in order to obtain as regular and extended contact as possible between the flame and the mantle; and (2) to provide as efficient a supply of air as possible to all parts of the flame or mantle. It is impossible, in practice, to carry out permanently the first requirement, since the mantle (from the commencement of its use) continuously alters its shape, and since the shape of the flame is contingent upon the gas pressure in the mains, and is thus also subject to constant variations. Endeavours have been made to comply with the second requirement by employing chimneys; but completely satisfactory results have not been obtained. In the known and most generally used incandescent gas-burners, the chimney conveys the external air to the root of the flame and compels it to flow through the chimney, and also the mantle, in the same direction as the flame, whereby an incomplete mixture of the air with the burning gases—that is to say, a slow and incomplete combustion—results; while the upper portion of the flame, and consequently of the incandescent body, is always surrounded, instead of with more or less pure air rich in oxygen, with air poor in oxygen and which has been burnt in the lower part of the flame, and also with valueless products of combustion.

By the method and apparatus which form the subject of the present invention, the disadvantages above described are said to be obviated, and, furthermore, several advantages compared with existing methods and apparatus are obtained. In lieu of heating the mantle by a bunsen flame situated axially within the incandescent body, the patentee makes use of one or more bunsen flames which are not parallel but at right angles to the longitudinal axis of the mantle and directed against the direction of motion of the air supply—the flames making contact with the incandescent body not laterally but at their points.



Figs. 1 and 1a are a longitudinal and a transverse section of a burner designed for single lamps. Figs. 2 and 2a are similar views of a multiple burner. Fig. 3 is a sectional elevation of a modified form of burner showing a novel method of suspending it.

The burner comprises a burner-tube A, which is not, as heretofore, upright, but horizontal, or slightly inclined to the horizontal. Furthermore, the tube is not open at the end opposite the gas-inlet nozzle, but is closed at B, and is formed around its periphery, and particularly on its lower half, with holes or orifices C; so that the gas issuing from the tube A generates flames which are transverse to the longitudinal axis of the tube.

The burner holes C can have the form of small openings, as in fig. 1, slits as in fig. 2, or the like, but are always so arranged that one or more lines of flames are obtained around the periphery of the tube C, to the longitudinal axis of which the lines are more or less parallel.

Upon the bunsen tube A, arranged as described, is fitted an incandescent body or mantle D in such a manner that the upper part along its whole length rests upon the burner-tube, which therefore serves as a support for the mantle, as shown in figs. 1 and 2. The mantle can, however, be mounted upon a special support, and it can, furthermore, lie flat upon the tubes (see figs. 2 and 3), or be supported upon projections N provided upon the upper part, as illustrated in fig. 1. With this arrangement, it will be obvious that the surrounding air will, by reason of the heat generated, flow to the burner in a direction contrary to that in which the flames issue from the burner holes, whereby the flames are obviously supplied with air free from products of combustion.

The mantle can be closed at one end as in figs. 1 and 2, or at both ends as in fig. 3. In the latter case, mica discs G effect the closure, or the mantle can be open at both ends—that is to say, can be in the form of a tube "without in any way adversely affecting the efficiency of the light."

The particular advantage of the arrangement as compared with existing arrangements is stated as follows: The burner-tube A, and thus the rows of flames C, can be made as long as desired. Furthermore, there is no practical difficulty in making mantles of any desired length. It is, therefore, "extremely easy to provide incandescent surfaces of any desired extent, and thus to generate light of any desired power without interfering in any way with the advantage of the complete combustion with short flame," since the length of the burner-tube A, the burner openings C, and the length of the incandescent body D can be made according to requirements. On the other hand, burners of smallest illuminating power (with only one or two openings) can be easily manufactured.

Various constructions can be made use of for preventing the heat of the flame from being transmitted to the gas-tap. For example, in the form of burner shown in fig. 1, the mixing-tube is simply made of a bad conductor of heat. In fig. 3, the burner-tube A is mounted between

points or centres F and H in such a manner that the heat of the tube can only be transmitted to the pipe I and tap E through points of connection of very small cross sectional area. The points H at the gas inlet end provide between them the necessary and usual openings for the supply of air to the tube; and a nut L is provided for pressing the tube tightly against the points. Or the points can be dispensed with, and the tube A merely suspended by two chains K (fig. 3) in such a manner that it hangs in the correct position in front of the gas-nozzle.

In the construction of multiple burner shown in fig. 2, a common mixing-tube N, with two or more laterally branching burner tubes A, is provided. This form can also be furnished with the auxiliary means described above for preventing the transmission of heat. Furthermore, the burner can be adapted for use as a single burner with only one burner-tube; and it is also possible to provide as large an auxiliary supply of air as is desired for the combustion of the gas—the area of the illuminating surface being simultaneously increased. The more burner-tubes there are branching from the common mixing-tube, the greater is the illuminating surface, without increasing the gas consumption, and the greater the auxiliary supply of air to the same quantity of gas.

Incandescent Gas-Burners.—Wilkinson, J. F., and Gregson, T., of Manchester. No. 2521; Feb. 2, 1904.

For the purposes of this invention, a tubular mixing-chamber is employed, with a gas-supply nozzle of the ordinary type at the bottom, near to which are the usual openings for the admission of air. This tubular mixing-chamber is about an inch longer than usual; the central portion being reduced in diameter for about one-third of its length (more or less) forming a parallel tube or neck with curved or sloping shoulders at D joining it to the upper and lower parts, which are of larger diameter. The top of the mixing-chamber is closed with a piece of wire gauze, which is fixed on it by a metal cap F, the upper part of which is of slightly smaller diameter, and perforated with small holes through which the mixed gases escape laterally and impinge on the inside of a short outer metal tube or ferrule, which extends to the top of the cap and rests upon it; the mixed gases passing upwards in the cylindrical space between the cap and tube, and being there united. The incandescent mantle is supported by the usual prop or fork fixed in the closed top of the perforated metal cap; the lower end of such hood or mantle fitting closely outside the outer metal tube. The metal cap F may be perforated with round holes as shown, or may be made with elongated perforations of any convenient form.

Hydraulic Mains.—Beard, G. F. H., of Crumpsall, Manchester. No. 2861; Feb. 5, 1904.

The patentee's object is to provide means for forming a separate hydraulic seal for each retort, or group of retorts, during such time as they are being drawn or charged, or are out of action, and yet capable of dispensing with the seal when the retort is in ordinary working operation.

Fig. 5 is a cross sectional view, partly in elevation, showing the invention adapted to an existing ordinary form of hydraulic main. There is a hydraulic main for each retort, or for more than one, of curved or rectangular shape, or a box provided with a lute or dip plate; and a number of the mains may be combined in one large receptacle, divided into separate and distinct compartments, each capable of receiving one or more dip pipes, which would be sealed or unsealed at one operation.

In figs. 1, 2, 3, and 4, curved pipes A, forming hydraulic mains, are shown provided with dip plates A^1; while in fig. 5 there is an ordinary hydraulic main B with dip pipe B^1. In fig. 1, two ascension pipes A^2 leading from two retorts are shown, each provided with one of the hydraulic mains A. In fig. 5, the ordinary hydraulic main B may be completely divided by plates or partitions into separate mains or compartments for each retort, or for more than one—an ordinary tar take-off (such as B^2) being connected with it and in communication with apparatus forming part of the present invention.

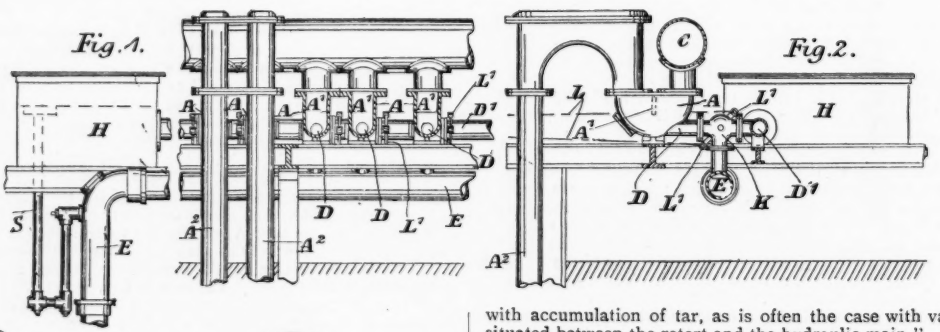
In figs. 1 to 4, each hydraulic main is in communication on the one side with a retort, and on the other side with the collecting main C. On such other side an additional outlet D is also provided, capable of being put into communication either with a tar-main E or with an ammoniacal liquor or water tank H (at will) by the manipulation of a valve or valves. In fig. 5, the collecting main and communication are not shown, but may be of any ordinary kind.

The valve referred to may take the form of a three-way cock, as K, so situated that when communication is opened by it between the tank and the hydraulic main, one movement only is necessary to close the communication and simultaneously open that between the hydraulic and tar mains.

In fig. 3, the valve K is shown in the position for establishing communication between the hydraulic main A and the tar main E; while in fig. 4 the valve is in the position for establishing communication between the hydraulic main A and the liquor or water tank through the pipe D^1 leading to it. In fig. 5, a corresponding pipe D^2 is shown. The valves referred to may be actuated by chains L and levers L^1 (fig. 2), or by levers only.

The tank H referred to is kept supplied with water or liquor at the level of the seal required within the hydraulic main—such as by the use of a valve controlled by a float R (fig. 5), with an overflow pipe S. When the ordinary form of hydraulic main (such as B, fig. 5) is used, the overflow arrangement may, in some cases, be made use of for the purpose of regulating the level of the seal, either with or without the employment of the additional overflow pipe S.

When it is desired to draw or charge a retort, or more than one, communication is established between the hydraulic main and the liquor or water tank H by opening the valve or cock K, when the liquid flows into the main until it reaches the level of the liquid in the tank; thus forming a seal at the dip plate A^1 or dip pipe B^1, for preventing back-pressure into the retort during drawing or charging operations. But when the ordinary working of the retorts is to be resumed, communication with the tank H is closed, and that between the hydraulic main and the tar-main E is opened, when the water or liquor in the former, and any accumulation of tar therein, is allowed to flow into the tar-main, and the gas from the retort passes into the collecting main in connection with each hydraulic main, without such gas having to force its way through a water seal in the hydraulic main. Added to this, the position of the valves or cocks for controlling the action described "is here such as to render them less liable to become choked with accumulation of tar, as is often the case with valves which are situated between the retort and the hydraulic main"



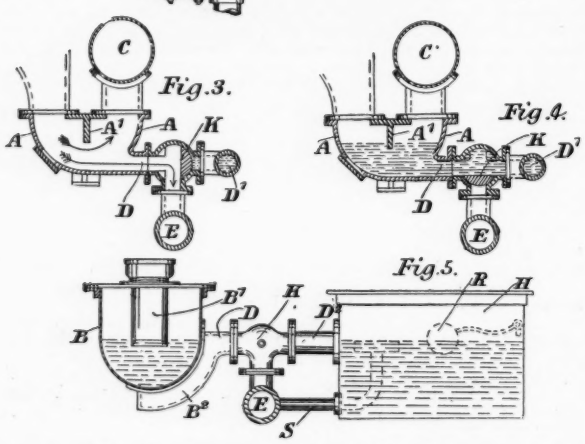


Fig. 1 is a longitudinal section partly in elevation, and fig. 2 a cross section, also partly in elevation, of a portion of the apparatus referred to. Figs. 3 and 4 are sectional views of a detail of the arrangement.

Prepayment Sale and Delivery Mechanism for the Supply of Gas.—Hawkyard, J., of Uppermill, Yorks., and Meters Limited, of Manchester. No. 10,512; May 7, 1904.

As shown on p. 41, the patentees propose to construct (of brass or other material) a rectangular frame or box—to be attached to the meter in the position necessary—made to contain the mechanism used in connection with the invention. In one end of the frame a hole is bored, through which the shank of the turnscrew B passes; the shank having fixed on it, or formed with it, the flanges which maintain the turnscrew in position. The receiver shaft C is concentric with the axis of the turnscrew, and is borne at the end immediately adjoining B by a bracket attached to one side of the case. At the other end, it is carried by a bush fixed in the side of the case. The coin-receiver D is a rectangular box fixed to the shaft C, and large enough to receive a coin of predetermined value when it is dropped through a slit in the case covering the box and its contained mechanism in the usual manner. Unless the bottom of the box is closed in some way, a coin so inserted would fall through into the receiver placed below for the purpose. In order to prevent this, there is fixed to the inner flange of the turnscrew an arm E, to the end of which is affixed a nearly semi-circular carrier, which is curved so as partially to surround the coin-receiver. One end of the carrier is long enough to pass under the coin-receiver and receive the coin when it is dropped into the receiver; while the other end is bent downwards and formed with a toe which projects

PREPAYMENT METERS.

CHANGING PRICE.
MOST SIMPLE.
NO WHEELS OR PARTS REQUIRED.

THIS METER CAN BE ALTERED *in situ.*

INSTRUCTIONS.

The Brass Plate has holes around its edge, numbered; these indicate the feet delivered for the Coin used To set the Meter, note Figs. I., II., III., IV.

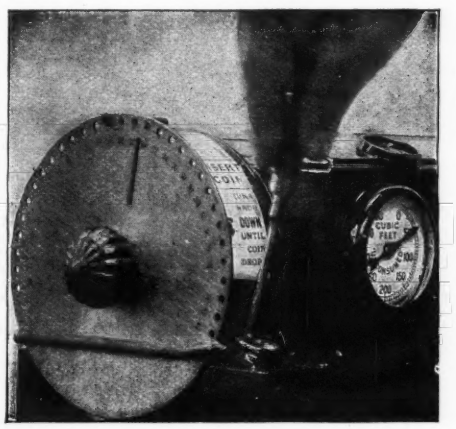


Fig. I.
Break Company's Seal and Remove Screw—THUS.

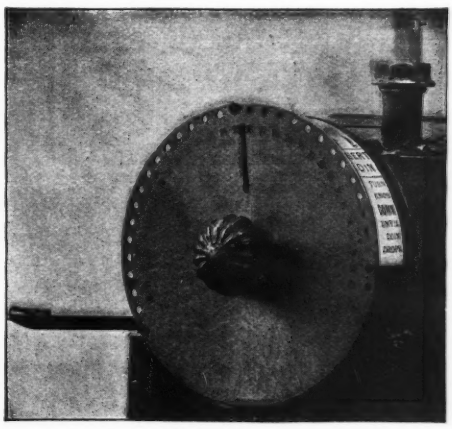


Fig. II.
Swing Band Back—THUS.

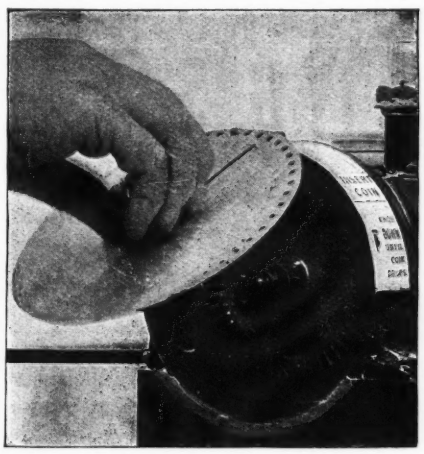


Fig. III.
Lift Plate Off—THUS.

Fig. IV.
Replace Plate—THUS.

Swing Band Forward—Replace Screw—and Re-seal.

NOTHING SO EASY. NOTHING SO ACCURATE.

THOMAS GLOVER & CO., LTD.,

GAS-METER MANUFACTURERS,

LATE OF CLERKENWELL, NOW 49, QUEEN VICTORIA STREET.

Telegraphic Address: "GOTHIC, LONDON." Telephone No. 6159 Bank.

BRISTOL: 28, BATH STREET. *Telegraphic Address:* "GOTHIC." Telephone No. 1005.

BIRMINGHAM: 57 & 58, BROAD STREET. *Telegraphic Address:* "GOTHIC" Telephone No. 3898.

MANCHESTER: 132 & 134, CORN EXCHANGE BUILDINGS. *Telegraphic Address:* "GOTHIC." Telephone No. 6107 Royal.

GLASGOW: 26, WEST NILE STREET. *Telegraphic Address:* "GASMAIN." Telephone No. 3716

BELFAST: 8, EXCHANGE PLACE, DONEGALL STREET. *Telegraphic Address:* "GOTHIC."

MELBOURNE: 23, WRIGHT'S LANE, LONSDALE STREET.

GRAHAM, MORTON & Co.

CABLEWAYS.
ELECTRIC TELPHERAGE & HAULAGE SYSTEMS.
CANTILEVER CRANES.
FURNACE HOISTS.
AERIAL ROPEWAYS.
CONVEYING PLANTS.

LEEDS

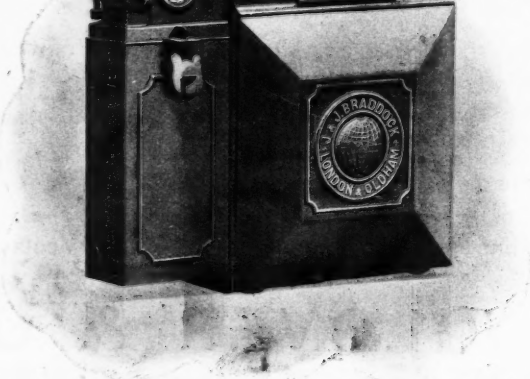
BRADDOCK'S PATENT PENNY-IN-THE-SLOT
(ALSO SHILLING-IN-THE-SLOT)

PREPAYMENT WET AND DRY GAS-METERS

VERY STRONG.

Unsurpassed
for
ACCURACY,
CONVENIENCE,
DURABILITY,
and
RELIABILITY.

WELL MADE
THROUGHOUT.



No. 251. Dry "Slot" Meter.

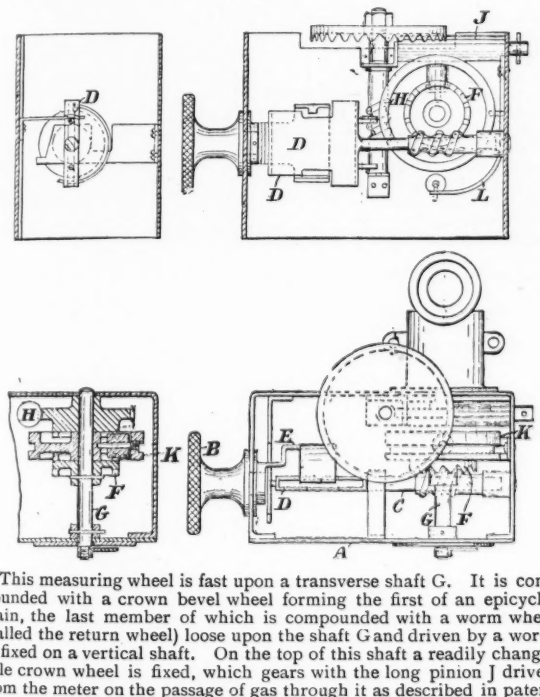
BRADDOCK'S
PATENT
CROWN CHANGE WHEEL.

Quickest,
most reliable,
and cheapest
method of
price changing
in situ.

Write for descriptive
Sheets.

J. & J. BRADDOCK (BRANCH OF METERS LIMITED), Globe Meter Works, OLDHAM,
Telegrams: "BRADDOCK, OLDHAM." National Telephone No. 254.
AND 45 & 47, WESTMINSTER BRIDGE ROAD, LONDON, S.E.
Telegrams: "METRIQUE, LONDON." Telephone No. 248 HOP.

wardly towards the coin-carrier, each end of which is provided with a notch to allow the toe to pass through it when the turnscrew is rotated. The slot in the receiver is made of such a length that, when the coin rests upon one end of the carrier, its upper portion obstructs the upper notch, and prevents the toe from passing through the notch. The effect is that when the coin is in the receiver and the carrier is rotated, the coin is pressed by the toe, and the receiver D, with its shaft C, is revolved. When the receiver has made a half-revolution, it is prevented from turning further by the carrier E coming in contact with the arm fixed to the frame. As soon as the turnscrew is turned back and the shield is removed from below the slot in the receiver, the coin falls out of the latter into a box placed there to receive it as is usual. The shaft C has fixed on it at one point a worm, which engages with a worm wheel F—the measuring wheel.



This measuring wheel is fast upon a transverse shaft G. It is compounded with a crown bevel wheel forming the first of an epicyclic train, the last member of which is compounded with a worm wheel (called the return wheel) loose upon the shaft G and driven by a worm H fixed on a vertical shaft. On the top of this shaft a readily changeable crown wheel is fixed, which gears with the long pinion J driven from the meter on the passage of gas through it as described in patent No. 9771 of 1893. The pinion is borne by a pin fixed in the disc K mounted loosely on the shaft G.

In the edge of the disc K a groove is formed for the greater part of the periphery parallel with the faces of the disc. At one joint it takes a direction at an acute angle to its general direction. There is pivoted to the frame a lever L, which partially surrounds the disc K and has fixed in it a pin engaging with a cam course; so that when the disc K is rotated and the bowl enters or leaves the slot, a rapid side-motion of the lever L is produced in accordance with the direction of the rotation of K. The lever L is connected by a pin to a spindle M, which passes through the stuffing box formed in, or fixed to, the face of the box. At the same point, an auxiliary valve-box is fastened to the outer face of the side, and the spindle M carries at its inner end the valve, which presses upon a seat in the auxiliary valve-box. The valve-box is attached to the meter, and is generally constructed in accordance with patent No. 18,406 of 1898, and forms no part of the present invention.

In order that the coin-receiver shall assume the correct position for the reception and discharge of the coin, there are fixed in one side of it two pins equidistant from its axis. To the frame is affixed a spring or weighted lever which has a notch or groove formed in it, with which the pins respectively engage when the coin-receiver makes each half-revolution—holding the coin-receiver in position for the reception and retention of the coin as already described.

Atmospheric Gas-Burners and Automatic Controllers for Same.—Cox, G. J., of Melbourne, Australia. No. 16,854. Aug. 2, 1904.

This invention has for its object "the more complete development, utilization, regulation, and economic control of a mixture of inflammable gas with air, when such a mixture is undergoing combustion through suitable and regenerative and detachable atmospheric gas-burner apparatus forming, in various modifications and combinations, this present invention, and to provide facilities for easy dissociation of the parts of such apparatus, whereby the same may be the more readily cleansed."

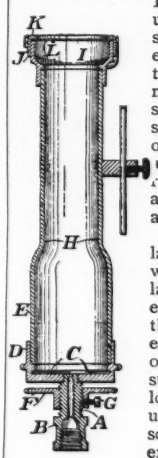
The apparatus is more especially designed to be used as a portion of the hot-plate of a gas-cooker, wherein the oven portion of the cooker is elevated and the hot-plate formed in a comparatively shallow bed, as described in patent No. 8151 of 1904; or parts of the apparatus may be arranged in combination with heat reflectors and draught protectors as described in patent No. 8153 of 1904.

The novelty of the invention (it is said) consists: 1.—In the formation of the atmospheric burner and correlative apparatus in such manner that (*a*) the combustible mixture may be preheated, or (*b*) the air be heated first and afterwards the mixture, or (*c*) the gas and air be both first separately heated and afterwards heated in combination prior to combustion. 2.—The manner in which the atmospheric portion of the burner is applied to, and partly supported and retained in position by, the gas-supply fitting complementary to an atmospheric gas-burner. 3.—The manner in which the gas-supply fitting is applied to the combined function of providing an injector gas-supply jet, gas-supply connection, gas-supply regulator, and as a partial support for the atmospheric burner. 4.—The manner in which the atmospheric portion of the burner is found, and its whole or partial support provided for so that the burner is held in correct line when in position, and yet may be easily detached from, or reversed on, the gas supply, and whereby the burner so reversed may be supported and be used as a griller, if required. 5.—The formation of a cut-off or controlling or reducing valve in connection with, and within, the combined apparatus forming the gas-supply fitting and burner support, whereby (under certain circumstances and by means of conjoined levers and links and a detachable heat refractory headpiece) the gas supply may be automatically reduced or altogether cut off from the atmospheric burner.

The various arrangements here outlined are fully set out in a lengthy specification of nearly eight pages, followed by eleven long claims.

Incandescent Gas-Burners.—Adams, W. W., of Shepherdess Walk, E.C. No. 6524; March 17, 1904.

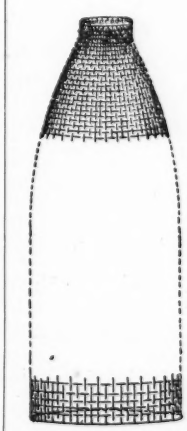
This invention is more particularly applicable to lamps using mantles of considerable size. There is a fine screw thread A round the nipple B, which is fixed upon the gas-supply pipe, and on its upper end is a cross-bar C, carrying a cylinder or socket D of considerable diameter, open at its upper end, into which is fitted the lower end of the bottom of the mixing-chamber E for the air and gas. Upon the nipple A is screwed freely a disc F, which can either be screwed up against the lower edge of the cylindrical socket D so as to entirely prevent the admission of air, or screwed down upon the nipple so as to regulate the admission of air into the socket exactly in the quantity required. A boss on the lower side of the disc F, with a set-screw G, fixes the position to which it has been adjusted.



Into the cylindrical socket D is fitted the lower enlarged end E of a vertical tube H, the upper end of which is enlarged, or has fixed upon it a socket I of larger diameter, which has fitted upon its upper open end a cap containing a disc of wire gauze, through which the air and gas, mixed in the vertical tube H and in the enlarged cap I at its upper end, pass and burn in an ordinary mantle arranged above it. The mantle is suspended in the usual way from a bent wire, the lower end of which passes through a hole in a projection upon a metal ring firmly fixed round the vertical tube H, so that the height of the hook, and of the mantle, can be exactly adjusted.

Manufacture of Incandescent Gas-Mantles.—Hill, H., of Nottingham. No. 23,444; Oct. 31, 1904.

These incandescent gas-mantles are constructed on foundations of cotton or other threads or filaments—that is a fabric foundation comprised of one or more weft threads running round the same, interlaced with a number of longitudinal warp threads. The patentee remarks that hitherto foundations have been principally produced on knitting or analogous machines, and the fabric, being elastic, may be modelled to a limited extent during its subsequent treatment into an approximately conoidal or taper form. But in a foundation produced by weaving, the fabric is inelastic, and its form cannot therefore be modelled during treatment; so that when drawn in by a suspensory thread at the top, folds or pleats are formed, which are very unsatisfactory. The same is true to a certain extent when knitted fabrics are employed; but the pleats or folds are not in this case so pronounced or so objectionable as in mantles constructed on woven foundations.



In order to produce a conoidal or taper mantle from a woven foundation, he proposes to use a foundation which is woven into the form required in the finished article, and thus obtain a perfect conoidal mantle without any distortion, folding, or stretching of the fabric. Such a mantle is illustrated—the top being of much less diameter than the bottom. Foundations of this kind may be produced on a loom of ordinary construction; the tubular form being obtained by disposing the threads so as to form two distinct sheds, and throwing the shuttle through each alternately. The conoidal form is obtained by employing an expanding and contracting reed, which is (say) opened out to form the base of one foundation, and then gradually closed in again to form the top portion of the next.

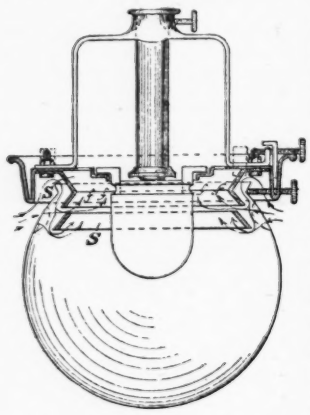
A continuous fabric produced as above described is then cut at the requisite points into lengths, each of which is approximately of the form shown. It is remarked that "finished mantles produced from foundations woven into the form described are of the ideal conoidal form so desirable for giving the best illuminating results, as they approximate to the form which the flame of the burner naturally assumes, and therefore a greater surface is brought into contact with the flame.

Inverted Incandescent Gas-Lamps.—Steinicke, T., of Berlin. No. 23,372; Oct. 29, 1904.

The purpose of this invention is to separate the current of fresh air entering at the top of the globular body surrounding the incandescent mantle from the current of rising products of combustion, in such a manner that the two currents assist and support each other, instead of counteracting each other, and the fresh air is supplied to the mantle in

a sideward direction, whereby a complete mixture of the atmospheric air with the gas and air issuing from the burner-tube is said to be obtained, and "perfect combustion" and a "development of great heat results."

The mantle is surrounded by shields S, preferably in the shape of truncated cones, and having a central aperture to receive the mantle with a sufficient play. The fresh atmospheric air entering the globe at the top, passes down in the direction of the arrows. The hot products of combustion around the mantle pass up in the annular space between the mantle and the shields; being prevented from spreading to the sides. The current of hot products of combustion, thus rising centrally within the annular space, draw the fresh air pouring into the globe towards the mantle in a direction slightly rising towards the central portion, and to the sides of the mantle. The two currents —one rising centrally in a vertical direction, and the other rising in an inclined direction towards the central portion— assist each other by their common rising tendency. The supply of fresh atmospheric air might be obtained through apertures near the upper end of the globe, as indicated by dotted lines. The atmospheric air passing between the shields and in contact with them, become heated before reaching the mantle; and the heated state of the air assists the combustion going on at the sides of the mantle. The atmospheric air, by being conducted through the shields, will also be prevented from undergoing the agitation of the air in the room where the lamp is burning.



APPLICATIONS FOR LETTERS PATENT.

27,670.—Reeves, E. A., "Prepayment meters." Dec. 19.
27,677.—Tooth, L. F., "Gas-lamps." Dec. 19.
27,707.—Michaud, G., and Delasson, E., "Indestructible filament for gas and electric lamps." Dec. 19.
27,771.—Young, W., and Milne, J., "Condensing coal gas for the more perfect removal of naphthalene." Dec. 20.
27,779.—M'Conechy, J., "Production of acetylene." Dec. 20.
27,798.—Simpson, W. M., "Gas-stoves." Dec. 20.
27,820.—Creeke, R. W. B., "Washers or scrubbers." Dec. 20.
27,918.—Jackson, M., and the Sunbeam Acetylene Gas Company, Ltd., "Acetylene generators." Dec. 20.
27,959.—Morley, J., "Inverted incandescent lamps." Dec. 21.
27,962.—Weston, J. E., and Higgs, E., "Valves for shutting off house supply and other purposes and for emptying pipes automatically to prevent frost bursting them." Dec. 21.
27,967.—Thorp, T. & F., "Analyzer for gaseous mixtures." Dec. 21.
27,999.—Machlet, G., jun., "Air or gas pumps." Dec. 21.
28,025.—Kindermann, S. & M., "Automatic switching or reversing device for gas-conduits." Dec. 21.
28,117.—Fischer, J., "Chimneys for incandescent burners." Dec. 22.
28,118.—Rooks, B. W., and Roberts, S. J., "Incandescent burners." Dec. 22.
28,123.—Biermann, F., "Meters." Dec. 22.
28,135.—M'Kenzie, J. A., "Engines and meters." Dec. 22.
28,152.—Kline, C. S., "Gas enricher." Dec. 22.
28,172.—Fielding, J., "Internal combustion engines." Dec. 23.
28,284.—Villepin, L. de, "Burners." Dec. 23.

Public Lighting of Falmouth.—In moving the adoption of a recommendation of the Falmouth Lighting Committee, that the Gas Company's tender of £706 2s. 6d. per annum for the gas supply, lighting, repairing, and maintaining the whole of the public lamps in the borough be accepted, Mr. Chard said the Council spent £817 on lighting in 1902, £753 in 1903, and £744 in 1904—or an average of £771 a year. The Company now offered to do the work for £706, which would mean a saving to the Corporation of £70 a year. The offer also included some extra lamps. Mr. Bullen remarked that this would take a great onus off the Committee and the Lighting Inspector; they would have greater regularity in lighting and extinguishing. The Council adopted the recommendation.

Devonport Water Arbitration.—A meeting of the Directors of the Devonport Water Company was held on Thursday to consider the course to be pursued with reference to the judgment of Mr. Justice Phillimore in the case referred to him by the Umpire (Mr. A. J. Ram, K.C.) in the matter of the purchase of the Company's undertaking by the Corporation, as reported in the "Journal" last week. His Lordship decided in favour of the Corporation on the main question of whether the Admiralty is entitled to an unrestricted supply of water for all their establishments in the town, but said that the Company might, if they chose, have the case referred back to the Umpire for further findings. The Directors passed a resolution expressing a desire to adopt this suggestion, and it was subsequently communicated to the Town Clerk. The arbitration will accordingly be reopened; but it is believed that the Umpire has sufficient evidence before him to enable him to arrive at the necessary findings without calling witnesses.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

Impressions at the Gas Exhibition.

Sir,—It was my good fortune and privilege to view the Earl's Court Exhibition during its closing days; but even now I am not sure whether surprise or pleasure reigned uppermost in my mind. Compared with twenty years ago, the contrasts were striking indeed. First there were splendid gas-engines, from the "National" baby to the big Otto, driving dynamos direct. Twenty years ago this could not have been done, even with the aid of countershafts. Next, stoking machinery claimed my attention. In this section I particularly noticed, and had carefully and most courteously explained to me, the action of a very simple, yet marvellous, retort discharger. This was undoubtedly one of the great "hits" of the exhibition, and was almost universally considered to indicate the immediate advent of a complete revolution in the cumbrous, costly, and complicated existing methods of retort-house working. Passing along, I observed another transition—steel pipes displacing cast-iron pipes.

The Ducal Hall was much to be admired. What struck me most there, was the artistic way in which the majority of the cookers and gas-fires were made. Formerly rough castings were considered good enough for gas-cookers. Some of those at the exhibition were got up in enamels; and a kitchen to match ought to make any discontented cook happy, and help to solve the servant problem. The Gaslight and Coke Company's exhibit seemed to have got "side-tracked," and did not receive the attention it deserved.

Next I came to the long passage in connection with the Ducal Hall; and here I think that some one palpably blundered. The passage was much too narrow, and consequently the exhibits on either side had no chance. Had a fire broken out here during a crush, the consequences would have been serious. I heard a great deal about an "Advisory Committee;" but I could discover nothing that they had specially done. Surely it was someone's duty to see to the safety and comfort of visitors to the exhibition.

On entering the Queen's Hall, the blaze of light was at first overpowering; but if the visitor refrained from looking at the mantles, the eye quickly adjusted itself, and one soon realized he was in a perfectly diffused light, restful and pleasing to the eye. The ventilation of this hall had been completely neglected; and considering that there were presumably practical men at the head of affairs, this was disappointing. It is well known by now that all high-pressure lighting consumes an enormous quantity of oxygen, and evolves a corresponding quantity of carbonic acid. A simple calculation and a moderate expenditure would have obviated this objectionable feature, and sent people away with a better impression of incandescent lighting. As it was, there were complaints of headaches, &c.

Among many impressions, I have formed an idea as to who really made the exhibition a success. Mr. Hunt modestly claims it for the Institution of Gas Engineers; Mr. Clare as modestly disclaims it for the exhibitors. The gas companies raised about £1000 towards the exhibition. The promoters, I was told, will make a handsome profit out of it. The exhibitors have spent anything between £60,000 to £90,000; and even at that, I was informed, some of them were "carpeted" by the Advisory Committee for not doing enough. Talks with exhibitors have left an impression upon my mind that the next time there is a gas exhibition there will be neither promoters nor Advisory Committee of any kind.

A Provincial Gas Director.

Dec. 28, 1904.

The Early History of Prepayment Gas-Meters.

Sir,—I was much interested in the letter by Mr. Samuel Cutler published in your issue of Dec. 20, having reference to the early days of the prepayment or slot meter.

Mr. R. W. Brownhill has been held to be the first inventor of the prepayment meter through which a certain quantity of gas was allowed to pass by the previous insertion of a coin. I have one of Brownhill's original models in my possession and which has lately been on show in the loan collection at the Earl's Court Exhibition. Brownhill's specification was dated May 13, 1887, No. 7012.

But I think that I may claim to be the next to take out a patent for a slot-meter; my specification being dated Nov. 11, 1887, No. 15,410, while in 1889 and 1893 patents for improvements were obtained. The first meters under my patents were made by Messrs. W. Parkinson and Co., and were by that firm placed upon the market.

Mr. Cutler will, I have no doubt, sympathize with me in the difficulty experienced in those early days of getting gas companies to seriously consider the question of using slot-meters. The idea of prepayment by the insertion of a coin into the meter was quite new, and doubts were freely expressed that a demand for such an instrument would not be likely to arise. What a change in 17 years!

W. E. Price.

Hampton Court Gas Company, Dec. 22, 1904.

The Proposed Gas Exhibition in Manchester.

Sir,—Referring to a resolution sent to me by Mr. Clare, the Chairman of the Exhibitors' Committee at Earl's Court, and the comments thereon in your issue of Dec. 20, I shall be glad if you will inform your readers that the Committee of the Manchester District Institution of Gas Engineers will not necessarily abandon the idea of an exhibition in Manchester next autumn. I have already received promises of support to easily fill St. James's Hall, Manchester. The principal refusals come from the heavy machinery section, which we are not particularly anxious to see here, as the idea is principally to educate our consumers, not ourselves; and as they are naturally more interested

in lighting and heating, we think an exhibition mainly supported by local firms would meet our views in case the London firms decline to take part.

A number of replies have been received from members, for the most part very favourable. Nearly all promise financial assistance, if required, and several make valuable suggestions. One proposes that any expenses incurred shall be *pro ratâ* to the make; another that an exhibition on a smaller scale than that at Earl's Court shall be held annually, taking the District Associations in turn, by which means each district would have a representative show every six years. A further suggestion on the financial side is from a local Company, who are willing to guarantee a sum not exceeding £50; while many are prepared to distribute free tickets.

These comments will serve as guides for those who have not sent in their replies, which I hope to receive by the middle of January at the latest. Of course, the matter must not be considered at an end until the Institution has had an opportunity of digesting the replies received.

H. KENDRICK,
Hon. Sec. Manchester District Institution of Gas Engineers,
Stretford, Dec. 27, 1904.

A Remedy for Naphthalene Troubles.

SIR,—For some years after the erection of regenerator furnaces with both inclined and horizontal retorts, I had great difficulty in satisfying the consumers, owing to stoppages caused by naphthalene in both mains and services. The deposits in the trunk mains became so great that it was necessary to clean them out thoroughly each year before the winter season came on. This was done by cutting oblong holes in them, about one-third of their diameter wide by 1 ft. 6 in. to 2 feet long, at distances of 100 yards from each other; screwing together lengths of ¾-inch piping, to which a cord was attached, and pushing through from one oblong hole to the other. A thicker cord was then attached and pulled through on withdrawing the piping, to which a sack of sawdust was tied. This being drawn a few times from one hole to the other, thoroughly cleaned the main. The first oblong hole was then closed by an iron plate, the second one being left open for the cleaning of the second length. All these cuttings, with the balloon holes, were marked and registered in a book for future cleanings.

This was a very satisfactory method of proceeding, inasmuch as I was certain that the mains were thoroughly clean, and that if there was any decrease in the pressure it was owing to the mains being too small. It was, however, a very costly and slow process, and for this reason various solvents were tried which were supposed to remedy all the defects and loss caused by naphthalene, but with no effect until in 1902 the Engineer was advised to try "gazine," which was a product sold by a firm in Brussels. This gave almost incredible results. All complaints ceased, and everything went smoothly through the whole of the winter. Two grammes of "gazine" were run into the main after the station meters for each cubic metre (35·3 cubic feet) of gas produced. This experiment was carried out at Milan, where the make of gas is 1400 million cubic feet per annum.

C. BOURNE.
Newcastle-on-Tyne, Dec. 29, 1904.

Fermoy Gas Company, Limited.—A Company has been registered with a capital of £10,000, in £1 shares, for the purpose of acquiring and carrying on Mr. R. Bruce Anderson's business of gas manufacturer in the town of Fermoy, carried on under the style of the Fermoy Gas Company. The registered office is at the gas-works in the town.

The Question of Free Cookers at Rochdale.—The decision of the Rochdale Gas Committee not to supply cookers free of charge is referred to by an anonymous writer in a local paper, who suggests that perhaps the minority might become the majority if a charge were made for fixing, or if a good deposit was asked for, to be refunded when a certain amount of gas was consumed, so as to ensure the continued use of the cookers for a definite time. The present charge for cookers is, he says, prohibitive to a great many people.

Manchester Water Supply.—The anxiety of the citizens of Manchester with regard to the water supply is now altogether a thing of the past. The stock in the reservoirs at Longdendale is equal to the needs of 84 days, in addition to which 20 million gallons a day are being received from Thirlmere. The next great work of the Water Committee will be the construction of a reservoir at the north-west end of Heaton Park, partly within the park and partly outside. At present, the Thirlmere water is sent into the mains as fast as it arrives; but it is the intention of the Committee by-and-bye to store a larger quantity. Hence the need for a second reservoir on the north-west side of the city, the area of which will be 105 acres. The storage capacity of the new reservoir will be 500 million gallons.

Gas Explosions at Purston (Pontefract).—Last Wednesday afternoon, several gas explosions occurred at Purston, a suburb of Pontefract, but fortunately without entailing serious personal injury. It appears that after the passing of a traction-engine along the Pontefract Road there was a strong smell of gas in the cellar of a house in which there is a well connected with disused drains running under a row of houses. No notice was given to the Gas Company; but two men entered the cellar with a light to endeavour to find the leakage. The result was an explosion, which lifted some of the flags in the floor. On news of the affair reaching the Manager of the Ackworth, Purston, and Featherstone Gas Company (Mr. George Moat), he proceeded to the spot, and while there other explosions took place in the cottages. He therefore promptly ordered the gas to be shut off from the Purston and Ackworth district. The next day the road was opened, and on Friday morning a fractured main was discovered. It had a break which was fresh and clean; and Mr. Moat at once had the length cut out. As the fracture allowed something like 3000 cubic feet of gas to pass per hour, the damage caused by the explosion is not surprising. But for it the Gas Company do not appear to be in any way responsible.

MISCELLANEOUS NEWS.

POISONING BY COAL GAS.

A Fatality in George Street, Hampstead Road.

Christmas was followed by a sad fatality, which occurred last Wednesday morning, to a family residing at 21, Little George Street, Hampstead Road. The house was mainly occupied by Mrs. Mansfield, one of the victims, and her five children, who retired to rest shortly after midnight, everything then being apparently safe. The mother, her two daughters (Alice, aged 24, and Mary, aged 8), and one of her sons, Sidney, aged 14 (the other victim), slept in the back room on the ground floor. Mrs. Mansfield usually called another son, George, in the morning; but on Wednesday she failed to do so. As the omission on his mother's part to call him was strange, he went down to her room. Failing to get an answer to his repeated knocks on the door, which was locked, he became alarmed, and going to the back of the house he broke the window, and so obtained entrance to the room. The place was full of gas, and on the floor he saw his mother, partially dressed, and her younger daughter; while on the bed were his brother and elder sister. All of them were unconscious. Obtaining assistance, he had them removed from the room. A doctor was summoned, and upon his arrival he stated that Mrs. Mansfield and her son Sidney were dead. The young woman Alice and her little sister recovered under treatment. Gas was not laid on to the house. Two or three persons in the adjoining house were also affected by the gas during the early hours of Wednesday morning; but fortunately they were aroused in time to prevent serious consequences.

The Coroner's Inquest.

An inquiry into the circumstances was held on Friday, at the St. Pancras Coroner's Court, by Dr. G. DANFORD THOMAS.

Mr. LUXTON watched the proceedings on behalf of the Gaslight and Coke Company; Mr. J. A. WHITE appeared for relatives of the deceased.

Evidence having been given by the son as to the finding of the bodies, Mrs. E. Bowen, the landlady of the house, said that there was a great deal of traffic in Little George Street, which was paved with granite. After medical evidence had been given to the effect that death had resulted from asphyxia, due to the inhalation of carbonic oxide and carbon dioxide, two of the Company's officials were called.

Mr. *W. C. Wigley*, a Divisional Inspector, said he had made careful inquiries into the matter before the Court. On receipt of information of the deaths, men were immediately despatched to open the road, and the 3-inch cast-iron main, about 16 feet from the line of buildings and 2 feet from the surface, was found to be broken clean in half. Pipes of this kind were laid on the natural earth, which would be liable to sink under heavy pressure, leaving the pipe without support, and consequently subject to fracture owing to the vibration and tremor caused by traffic. A large volume of gas would thus escape, and percolate through the softer earth beneath the granite cubes and pitching. His own theory was that the crack was due to the heavy traffic and the previous silting away of the earth beneath the pipe. The fracture probably occurred about twelve or one o'clock in the morning; and the gas would have percolated into the houses within five minutes. A pipe was practically indestructible, being of cast iron, if of suitable size; and there would be no degeneration of material by rusting. Pipes of this class frequently broke—sometimes across, at other times longitudinally. The escaping gas travelled underneath the road, and the houses from No. 1 to No. 21 were filled with gas; the latter being the first the gas entered, as the fracture in the pipe was only about 6 feet distant. Gas-pipes were never laid in concrete. Drain-pipes, however, were, with the object of preventing sewer gas leaking into dwelling-houses. This particular pipe had probably been laid much longer than ten years.

In answer to Mr. WHITE, witness said he had examined the joints of the pipe, and they were all perfectly sound. They were expansion joints, and in the case of subsidence the lead would no doubt give a little. There was no periodical examination of mains, which were, however, constantly being uncovered at places; and until an escape of gas was detected there were no means of telling that there was anything wrong.

In answer to Mr. LUXTON, witness said the Company had 2000 miles of mains in London, and it would be impossible to be constantly inspecting them.

The CORONER observed that the pipe appeared to be a good substantial one, and no amount of inspection would tell whether it would crack under a heavy weight. In England, the French system, in which water pipes and mains were carried in one tunnel, had not been adopted; and therefore the whole of the roads would have to be taken up for the purpose of looking at them. He asked witness if there was any estimated period for which a pipe should last.

Witness said for ever, in the way they were constructed. The ground under the street appeared to be made-ground, and years ago he believed a new sewer was constructed. There did not appear to be any London clay.

Mr. *G. F. L. Foulger*, the Company's Chief Distributing Engineer, stated, in answer to the CORONER, that he was unable to suggest any improvement in the method of main-laying. The present system had been in vogue since the introduction of gas—a period approaching a hundred years. A bed was formed on the earth, shaped to the barrel of the pipe; and where the pipes were jointed, the trenches were widened out, so that the earth should not be unnecessarily excavated below the barrel of the pipe. He knew that this method was not relied upon in the case of sewer pipes, which were laid in from 6 inches to 8 inches of concrete. But those were earthenware pipes, and there was no necessity, as there was in the case of gas-mains, to get to them for the purpose of putting in connections for house services. If the gas-mains were laid in concrete, it would have to be broken through every time a fresh connection was wanted; and the pipe would in all

probability be broken in the process. Cast-iron pipes were perfectly rigid, and must crack under pressure. Drain-pipes, again, were laid at a much greater depth than gas-pipes. The Company had at times placed a concrete bed underneath a valve; but it was found that where subsidences had occurred, the concrete had gone down as well as the pipe, for if there was not a good foundation for the pipe, there was not one for the concrete. He could give an instance where they had put in a bed of concrete 3 feet thick under a valve in very bad soil, and the whole had gone down in conseqnence of the pumping operations for the Blackwall Tunnel and the new County Council Bridge at the end of the East India Dock Road. An enormous quantity of water was pumped out of the soil; and when the whole of it had been taken out at what might be called the "sponge," it was found, when they opened the ground, that this 3 feet bed of concrete upon which the valve rested had gone down with the valve itself. It would be seen, therefore, that unless they could get a suitable foundation for one, they could not get it for the other. Sewers generally went to a much greater depth and were practically laid upon maiden soil. A fair average depth to which the London soil was made up above the original marsh level would be from 10 to 12 feet. It was impossible to restore soil as it was originally. This fact might be well illustrated by the difficulty of putting back straw into a crate of crockery that had been unpacked.

The CORONER remarked that it must be left to engineers to devise what was most suitable. The matter had, of course, been fully under consideration, as the cracking of pipes appeared, from the evidence of the Divisional Inspector, to be a not infrequent occurrence.

Witness added that the matter had been fully considered. The Company's district was a very large one, commencing two miles below North Woolwich, and, with the exception of a small district round Stepney and Bow, extended through the City and West End nearly to Hanwell. On the opposite side, it extended from the district of the South Metropolitan Gas Company at Clapham Junction right away to Hendon. The size of the largest main was 48 inches. The big pipes were also liable to break; but, of course, a big main acted to some extent as a girder, and was a very strong thing indeed. When a main cracked, the two portions remained in opposition to some extent. He estimated the quantity of gas that escaped from this particular main at 1500 cubic feet per hour—a very much smaller quantity than the main was capable of passing with the ends unobstructed. As to the reason for the earth failing away from underneath the pipe, London subsoil, as he had said, was composed necessarily of made-ground, as there were sewers in every road; and however careful the local authorities might be, it was impossible for them, after excavating, to put the soil back in the same condition as before. This meant that there was always a space which would be affected by vibration. This particular road, being paved with granite cubes and grouted and pitched, was impervious not only to gas but to water. Consequently, a shower of rain did not help to consolidate it and form a homogeneous mass, but left the subsoil perfectly dry; and vibration causing it to silt away, the time came when the main must act as a sort of girder and support the road until ultimately the strain would become too great. There was no flaw in the pipe, which was a particularly good sample; he did not think he had ever seen a better. He had been the Company's Chief Distributing Engineer for fifteen years, and had been in their service for forty years; and he did not recollect a single fatal accident occurring in their district on all-fours with this one, or due to any escape of gas from a main in the street.

The CORONER said he thought they now understood pretty clearly what had happened. Exactly how the fracture came about, they did not perhaps quite know; but they had had evidence that these fractures did occur, and he supposed would occur again occasionally. With a view to seeing whether anything could be done to prevent or minimize these accidents, he had asked the Engineer his opinion; and it appeared that the condition of London was such that it was very difficult to avoid them, owing to the roads having to be taken up from time to time for sewers and other purposes, leaving behind the made-up material, which might become dry and sink and leave the pipes without support, thus exposing them to the effect of heavy traffic. It would naturally be supposed that the ingenuity and skill of the Engineers would be directed to the facts, and that they would try, for their own sakes, to prevent these fractures, so as to avoid the necessity of repairs. As to the unfortunate cases of death before them, the Jury would probably agree that in each one death was due to asphyxia or suffocation by the inhalation of coal gas at a time when there was an escape, from a pipe in the roadway, of gas which penetrated to a basement over which the deceased were sleeping, and that death was accidentally caused. The Jury had had all the information that was to be obtained, and must leave the matter where it was; but it would be for those in charge of gas-works to see if anything could be done to prevent the recurrence of such a calamity. It was not, he thought, the business of the Jury to make any suggestion, as they might suggest the wrong thing; and the matter must be left in the hands of those who had authority, and were capable of obtaining the very best advice. Of course, it was to their interest to prevent such a thing occurring again. He did not remember any similar case; and the presence of gas was so patent to the nose, that there was no difficulty in getting out of the way of it.

The Jury returned a verdict of "Accidental deaths," in accordance with the Coroner's direction.

According to a telegram sent from Prague, through Reuter's Agency, on the 29th ult., considerable subsidence of earth took place during the progress of canalization work in the city, with the result that damage was done to the gas-mains. The escaping gas penetrated into the houses in the vicinity of the operations; and up to the time of the despatch of the telegram, 32 cases of the poisoning had been reported—two of them being serious. Medical and police assistance was promptly procured with the view to prevent further mishaps.

Last Wednesday, the police in the York Road Barracks, Belfast, were informed of a sad case of gas poisoning, the victim being a man named Elias Pratt. Deceased had been employed as a coachman, and on the morning of the above-named day he was found in the Jennymount stables, there being a strong smell of gas in the apartment. A medical man was called, but his services were not required, as the unfortunate man was beyond human aid.

It may be remembered that an old couple named Hunt were recently found unconscious in bed at No. 105, Cambridge Road, Southport. They were suffering from gas poisoning owing to having inhaled the fumes from a gas-stove which had been left on a table in the bedroom; the grate being blocked up with brown paper. Mr. Hunt, who was 79 years of age, died three days after, as reported in the "JOURNAL" for the 20th ult. (p. 927); and Mrs. Hunt, aged 70, succumbed on the 23rd. The Coroner's remarks at the inquest on Mr. Hunt, to the effect that people made a great mistake in interfering with ventilation by blocking up fireplaces, have given rise to favourable comment in Southport.

PUBLIC COMPANIES AND THE OPENING OF STREETS.

At the Meeting of the Lambeth Borough Council on the 22nd ult., the Highways Committee reported that they had had under consideration the subject of the opening of streets by companies possessing statutory rights, more especially in connection with a case at Miles Street, South Lambeth. The Borough Engineer had explained that before a street was repaired or reinstated, notices were given to all the public companies having statutory powers, inviting them first to execute any works, repairs, or extensions to their mains, so that the need for disturbance of new paving work might be minimized. In the case of Miles Street, the usual notices were duly given; and, in the opinion of the Committee, it was unfortunate that the Gas Company could not take advantage of the opportunity, and repair their mains before the widening had been effected. Directions had been given that the attention of the Company should be drawn to the complaint made, which in this instance appeared to be well founded. It was true that in these cases the Council did not suffer direct pecuniary loss, inasmuch as all reinstatement charges were borne by the company breaking up the paving. But it was obvious that relaid paving was not so satisfactory as undisturbed work; and, in addition to this, it was extremely probable that the eventual life of the former was less than that of the latter, as the ground underneath, when once disturbed, never again entirely recovered its homogeneity and firmness. The Committee added that the Traffic Commission, which is still sitting, had taken evidence upon the point, and would probably in due course report upon the subject in all its bearings. The report was adopted.

MANCHESTER CORPORATION GAS UNDERTAKING.

The Past Year's Work.

A representative of the "Manchester Courier" has obtained from Mr. Charles Nickson, the Superintendent of the Manchester Corporation Gas Department, some interesting details of what has been accomplished during the past twelve months.

Several important works, begun or contemplated in the previous year, have made good progress. At Gaythorn, the demolition of the first half of the old and obsolete retort-house is being followed by the erection of a new building with retorts on the inclined principle, and which, when completed during next summer, will provide as much manufacturing power as the whole house on the old principle, and at a much less cost. This work will be ready for the winter of 1905; and steps will then be taken to effect the same change and improvement in the second half of the old house. The lack of the services of this house during the fog of last week led to much of the difficulty then prevailing, as its manufacturing capacity would amount to 3 million cubic feet. No extensive changes have been effected at either the Rochdale Road or Bradford Road station.

Since the abolition of the charge for the hire of gas-cookers, in June, 1903, there has been a steady demand to the extent of about twenty a day. The number of gas-cookers at present in use is 22,300, as compared with 16,700 the previous year; while gas-engines have increased from 1565 to 1703. There are now 147,562 consumers in the Manchester area of supply, which is an advance of 4450; prepayment meters numbering 45,700, as against 42,596. There are 19,181 public lamps, including about 5000 incandescents. The latter are, however, still being added to in the principal streets and on all the tram routes. The number of men employed in the manufacture and distribution of gas and the general administration of the department is about 2000.

The amalgamation of the districts of Withington and Moss Side was accomplished on Nov. 9, from which date the price of gas in these districts had been reduced by 3d. per 1000 cubic feet. There is, however, an exception in the case of a small portion at Withington at present supplied by the Stretford Gas Company, and which is the subject of negotiation between the two authorities. The price of gas was reduced by 2d. per 1000 cubic feet both in and beyond the city boundary from June 24 last; and it now stands at 2s. 4d. and 2s. 7d. respectively. Notwithstanding the increase in the number of consumers and the extended use of gas-cookers and other appliances, there has practically been no increase in the sale of gas during 1904 as compared with 1903. Though it is admitted that the electric light has had some effect, the chief causes of this state of things are said to be the depression of business and want of employment, which have compelled consumers to economize. The very general adoption of the incandescent system and the unusually open weather during most of the year, have also had their influence. It has, of course, yet to be seen what will be the result of the consumption during the three months to March next, as to whether the estimates for the year will be fully realized. During the past year, the Gas Committee have paid the sum of £70,000 out of profits in aid of the rates. This makes the aggregate sum so paid since the gas-works became municipal property £2,629,301. The total value of the works, property, and other assets is £2,769,750; and the total liabilities are £1,340,052.

LOANS FOR GAS AND WATER PURPOSES IN IRELAND.

The annual report of the Local Government Board for Ireland for the year ending the 31st of March last, which has lately been issued, contains a list of the loans granted in that period for purposes of gas and water supply. Dealing first with the former, we find the Ballymena Urban District Council obtained £29,000 for the purchase and extension of the gas-works; the Cavan Rural District Council borrowed £200 to enable them to light the town of Armagh; the Coleraine Urban District Council were granted £2500 for the erection of gas-works; the Limavady Urban District Council borrowed £2200 for the purchase and reconstruction of gas-works; and the Newtownards and Strabane Urban District Councils obtained £600 and £15,000 respectively to improve their gas-works. The loans granted for water-works purposes were as follows: Belmullet, £120, for affording a water supply to the village of Bangor; Boyle, £6050, for supplying water to the town; Clifden, £168 15s. 4d., a supplementary loan to enable the Rural District Council to finish the Roundstone water-works; Coleraine, £1750, to complete works; Cork, £12,000 for a new engine and house, £2000 for a high-level reservoir, and £2000 for a filter tunnel; Dublin, £54,100 for improvements, and £15,200 for additional mains; Dungannon, £1700, for improvements; Fermoy, £338, for providing a supplementary supply to Glanworth; Galway, £12,000, for the construction of works; Glenamaddy, £500, sinking wells and erecting pumps; Larne, £400, for improvements; Listowel, £520 for furnishing a supply of water to Duagh, and £92 18s. for a supplementary supply to Newtownsandes; Londonderry, £1662, for a reservoir at Ballymagowan; Milford, £500, for supplementary water and sewerage schemes; Mountmelick, £200, for wells and pumps; Skibbereen, £600, for improvements; Tralee, £1600, for extensions; Waterford, £500, for a water supply for a certain specified district.

GENERAL GAS COMPANY OF FRANCE.

The issue of "Le Gaz" for the 15th ult. contained some figures showing the progress of the above-named Company in the year 1903-4, as revealed at the last annual meeting of shareholders. The profits amounted to 839,040 frs. (£33,561), which added to the amount brought forward made a total of 1,402,075 frs. (£56,083). It was decided to pay a dividend of 32·50 frs. per share, and to deduct 600,000 frs. from the remaining profits for the providence fund. The balance of 502,075 frs. (£20,083) was carried forward. Some particulars were given with regard to the various undertakings affiliated with the Company. It was stated that the profits of the Bucharest Gas Company were greater than those for the previous year. Owing to various circumstances, the negotiations entered into with a view to a renewal of the concession (now drawing to a close) could not be officially resumed. However, at the time of the meeting, the matter was under the serious consideration of the Directors. The results obtained by the Saint-Josseten-Noode Company were affected by the decrease in the tariffs due to the renewal of various contracts by the General Gas Company. The dividends were nevertheless paid as usual, and a speedy increase in profits was looked for. At Tours, the dividend was higher than previously. The consumption of gas increased regularly, and the electricity supply undertaking yielded excellent results. The situation of the Perigueux Company continued to improve, and the dividend was much greater than before. At Athens, the progress noted for some years was again apparent. The consumption of gas increased, and the supply of electric current showed further signs of improvement. These good results were made more conspicuous by a fall in the rate of exchange. The situation of the International Gas Company was very much better, in spite of great depreciation, and the dividend was higher.

OLDHAM ELECTRICITY WORKS.

The Question of Depreciation.

There were some lively passages recently during the opening day's proceedings of a Local Government Board inquiry at Oldham. Mr. H. R. Hooper was the Inspector; and the loan desired by the Corporation was £48,114, in connection with the Electricity Department. The greater portion of the money was required for mains; but a considerable sum was to cover expenditure already incurred. There was a great body of opposition; and early in the inquiry the Inspector elicited that nothing had been set aside for depreciation, and that the assets and liabilities of the Corporation were arrived at by merely deducting from the capital expenditure the amount so far paid off—the undertakings being valued at the actual outlay.

Mr. Byrne, who represented the Oldham Master Cotton Spinners' Association and the Engineers' Association, in stating the objections of his clients to any indebtedness of the borough, remarked on the very great increase of rating that had already taken place. He mentioned that the assets were said to exceed the liabilities by upwards of a million pounds; but if they were only brought up to the value that was put upon them by taking everything that the Corporation ever spent money upon, and saying that to-day this was worth its original cost, it seemed to him that the sum named was a perfectly unreal excess of assets over liabilities. Taking things which had a life and were in time worn out, and when elderly giving them the value which they had at the beginning, seemed a wrong way to estimate assets. The liabilities did not change. His clients were inclined to think that to put assets calculated in this way against liabilities was entirely fallacious. No doubt some of the assets might not need depreciation, but there must be some appreciation, and there was none provided for. How could this be a sound way of keeping accounts? How could the ratepayers or the Corporation know the financial position if the depreciation was not taken into consideration? The loan desired in great part covered machinery, and the time asked in which it was to be repaid was 30 years. Was it too much to say that after twenty years had passed the machinery would certainly not be as good as new? Even 5 per cent. depreciation was rather small to put on it; but here was no depreciation at all. It might be argued that the Corporation having provided for interest on the loan and sinking fund for redemption, there was no need to allow for depreciation. He granted this; but only on one hypothesis—that the loan must be repaid within the life of the machinery in question.

Before adjourning the inquiry *sine die*, for the production of certain detailed particulars, the Inspector referred to the money that had been expended in anticipation of the loan. He elicited that these sums had been procured by means of an overdraft at the bank, on which the interest payable was ½ per cent. above the Bank rate, and commented on the payment of this extra rate of interest during the years over which the expenditure was spread. No sinking fund had, he said, been provided; and where the sanction had been anticipated, no doubt the Board would deduct the period for which interest and sinking fund was due.

FAILURES OF THE ELECTRIC LIGHT.

Ilford was in a state of excitement last Wednesday night, owing to the failure of the electric light in consequence of the fusing of a cable in the High Road. About nine o'clock, smoke was seen issuing from beneath the pathway. This was followed by the raising of a paving-stone, and immediately flame burst out to the height of several feet, and continued to burn for some minutes. Employees from the Lighting Department of the District Council and the Gas Company were quickly on the spot; but the latter found the main in the immediate vicinity uninjured. The result of the accident was the extinction of the lights in the High Road, as well as those in a large number of business premises and private houses. Where incandescent gas lighting was in use, however, the brilliant illumination it afforded presented a striking contrast to the prevailing gloom; and those who have persistently supported the electric light undertaking of the Council must have had their confidence in it somewhat shaken. At the Town Hall, a concert was in progress when the audience and performers suddenly found themselves in darkness, which was slightly relieved, however, by the small gas-jets which have been provided as a stand-by in case of need. The gas installation in the centre of the ceiling saved the situation. It was turned full on, and served as an excellent substitute till the electric light came back. But for this the concert must have come to an inglorious end, for no one knew how long the darkness would continue. We learn from the local paper from which the foregoing particulars were obtained that in some of the private houses the family brought ornamental candlesticks into use for the first time; while in others a move was made to the scullery or the kitchen, where the gas-cooker happened most luckily to be supplemented by a gas-burner; and there the evening was rounded off.

On Friday, the 23rd ult., about half-past nine in the evening, Worcester was in darkness for about half-an-hour owing to a short-circuit. At the Theatre Royal, which is lighted by electricity, the failure was peculiarly irritating. A number of candles had to be requisitioned for the front of the stage, the passages, and other parts of the building; and in the darkness one of the windows was broken. Similar inconvenience was experienced at the lecture theatre of the Victoria Institute, where the students of the day school were holding an entertainment. The Mayor was present when a dramatic sketch, given by the students, was interrupted by the darkness; and there also candles had to be brought into service. The failure of the light was still more serious to the tradesmen, occurring at a time when business was at its height.

In Christmas week Portsmouth had a reminder of the liability of the electric light to fail at the most inopportune moment. On New Year's Eve twelve months ago the current suddenly ceased, and the town was plunged in darkness; and this experience was repeated on Wednesday, the 21st ult., when the streets and shops were packed with busy buyers. Shortly before 6 o'clock, there was an explosion at the electricity works; and immediately the lights in the streets, shops, and private houses were extinguished. Darkness, however, only prevailed for about ten minutes, at the end of which time the light was resumed. The primary cause of the accident was the failure of an armature, which resulted in the destruction of the fuses of the main dynamo.

Reduction in Price.—At a recent meeting of the Hexham District Council, a letter was read from Mr. Herbert Lees, the Engineer and Secretary of the Hexham Gas Company, informing the Council that after January the price of gas would be reduced to 2s. 10d. per 1000 cubic feet, being a reduction of 2d.

Electricity Objected to at Penrith.—Considerable opposition on the part of the ratepayers was manifested at a recent Local Government Board inquiry at Penrith with reference to the decision of the Urban District Council to embark on an electric lighting scheme. The amount desired was only £6850; but even this is a large sum for a small and not very progressive non-manufacturing town. A petition was put in, signed by 635 ratepayers, to the effect that the scheme was not required. It was also urged that it was inopportune, inasmuch as it would shortly be necessary to spend another £3500 on the gas-works. It was also stated that when the scheme was passed the voting was nine for and five against it; and that this result was only attained by certain representatives violating their election pledges. With regard to the light itself, Mr. Arnison (who appeared on behalf of the opponents) said that electricity had not been shown to be the best or the most satisfactory illuminant. In the City of London, the thoroughfares were being lighted by gas in preference to electricity; and the idea of bringing an electricity supply to such a small town as Penrith was absurd in the extreme. The finances would not allow of any such costly experiments.

TORPOINT WATER SUPPLY.

The question of promoting a Bill in Parliament for improving the water supply has been discussed at a special meeting of the Torpoint District Council. Mr. T. E. Reynolds (the Chairman), in moving that the Bill be promoted, said that for a considerable time past the water supply had been unsatisfactory; the existing works being totally inadequate for the district. The Admiralty were anxious that steps should be taken to provide a better supply; while they in Torpoint were equally anxious that the Admiralty should extend their buildings on that side of the river. The Witheybrook scheme, on which the Council had decided, would provide an abundant supply of water of excellent quality, without materially affecting the flow of the stream. The War Office had expressed the intention of becoming a fairly large customer. The Engineer's estimate of the cost of the scheme was £45,000; but application would be made for £50,000, so as to cover the cost of mains and connections to the forts. It was hoped to obtain a period of sixty years for repayment; and it was believed that, with the growth of the district and the receipts from Government establishments, a good financial result would be obtained. Mr. W. Rose (the Chairman of the Water Committee) said that for some years they had experienced anxiety with reference to the water supply; and in dry summers they had been unable to maintain a constant service. In answer to a question, Mr. J. T. Bond (the Solicitor to the Council) said that unless they had the assurance of the Admiralty support, the scheme would necessarily come to a stop. They were proceeding with the Bill at the wish of the Admiralty; and he had no doubt that the War Office would also be consumers.

The resolution to promote the Bill was carried unanimously.

BRADFORD WATER-WORKS ARBITRATION.

Awards in the Nidd Valley Estates Claims.

Mr. J. H. Hanson, the Umpire in the arbitration recently held in London in connection with claims made upon the Bradford Corporation in respect of estates in the Nidd Valley required for their water-works, has made his awards. The proceedings were reported in the "JOURNAL" for the 22nd of November (p. 628). Three estates were involved—viz., the Oxley (known as Woodale and Winterside), the Scarr House, and the High Woodale. Of the first-mentioned estate, which has an area of about 1027 acres, the Corporation had been allowed to take possession of 817 acres; and it was the compulsory purchase of this land which Mr. Hanson, who was assisted by Mr. Fenwick and Mr. Gott as Arbitrators, was called upon to determine. The devisees of the late Mrs. Oxley, by whose family the estate has been held for 150 years, claimed £15,000 as compensation. Mr. T. Taylor Wainwright, the Vice-President of the Surveyors' Institution, put the value of the land at £14,871; Mr. J. Farrar and Mr. J. Maughan estimated the value at £15,929; Mr. J. Mason's figure was £14,771; and Mr. E. Lovell Clare submitted an estimate of £16,566. The chief attraction of the estate was its sporting character; and Mr. Wainwright, in the course of his evidence, said that the acquisition by the large towns of the great watersheds was reducing the number of shooting properties, thus enhancing the value of those that remained. For the Bradford Corporation, Mr. R. B. Broster, the Resident Agent for the Duke of Devonshire's Keighley Estate, was called, and his estimate of the value of the land was £3786. The Umpire has awarded the sum of £7065. From the Scarr House Estate, of which Mrs. Wright and Mrs. Winn are the joint owners, the area taken by the Corporation was 551 acres. A reservoir is being constructed on this land. Mr. Wainwright estimated the value of the property at £13,121 and Mr. Farrar at £14,420. On the other hand, Mr. Broster's figure was £2696, in which Mr. R. Armistead concurred. The award is £5525. In the case of the High Woodale Estate, the land for which compensation had to be fixed comprised an area of 325 acres, of which 89 acres were freehold and 236 leasehold. The owners named in the notice to treat were Simon Thompson, Mary Thompson, and Matthew Mower. The amount claimed for the leasehold land was £7534, and for the freehold £1076. This was also Mr. Farrar's valuation, with which that of Mr. Maughan practically agreed. Mr. Clare's estimate was £6451 for the leasehold land and £1174 for the freehold. For the Corporation, Mr. Broster's total valuation was £2311. The compensation awarded in respect to the freehold land is £653 if Mr. Thompson is entitled to certain sporting rights, and if not the amount is £528. In respect to the leasehold land, the sum awarded is £3091.

Filtration Scheme for Pittsburg (Pa.).—The Filtration Committee of the Pittsburg City Council have before them various proposals for improving the water supply of the city. They comprise filter-beds costing £720,000; pumping plant and washers, clear-water reservoir, river intake, and pipe-lines, £480,000—bringing the total cost of the proposed improvements up to £1,200,000. Most of the money for these works will come from a recently-authorized issue of £1,000,000 which is now in the Courts, owing to the refusal of the City Controller to advertise for bids for the bonds.

Halifax Corporation Bill.—At a special meeting of the Halifax Town Council, convened for the purpose of considering the Bill to be promoted in the forthcoming session of Parliament, it was announced that three of the clauses had been dropped. One of these is clause 46, which was to empower owners of cottages to collect their gas-rates. This clause, explained Mr. J. W. Clark, was promoted entirely in the interests of the owners of cottage property; but as it did not appear to commend itself to these owners, it had been withdrawn. It would have been of no advantage whatever to the Corporation.

WALKER'S PATENT

SULPHATE OF AMMONIA PLANT

Recovers the WHOLE of the Ammonia.

SULPHUR RECOVERY PLANT

For Recovering the Sulphur from Waste Gases of Saturator.

FOR FULL PARTICULARS AND MODELS OF PLANT, WRITE

C. & W. WALKER, Ltd.,

Midland Iron Works:
DONNINGTON, NEWPORT, SALOP.

London Office:
110, CANNON STREET, E.C.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The ratepayers of Monifieth have decided—though only by the narrow majority of twelve—that the gas transfer is to go on. The poll was taken on Tuesday last. On the eve of it, the opposition made two efforts to influence the electorate. One was a letter by Mr. J. B. Crichton, which was published in a local newspaper on the morning of the poll. In it he said he considered the time was not opportune for the burgh to adopt the Gas Acts. The other effort was a lengthy circular, signed by ex-Bailie Jas. Anderson, which was sent to every householder in the burgh, on Monday, Dec. 26. The effect of all this output of energy was small. There are 500 electors on the roll, and only 240 exercised the franchise. Of these, 122 voted in favour of the transfer, and 110 against. Locally the vote is taken as an emphatic approval of the policy of the Town Council, because it is regarded as almost indisputable that all who were antagonistic recorded their votes, and that nearly the whole of the 260 who did not vote were favourable to the transfer. Monifieth is singular in this respect, that the poll which has just been taken is the second of its kind. In 1897, when the place was formed into a burgh, one of the first things the Town Council did was to adopt the Burgh Gas Supply Act—their intention being that the gas-works to be erected should be the property of the Corporation from the beginning. Then, as now, after the Act had been adopted, opposition was offered, and a poll, taken towards the end of January, resulted in the action of the Town Council being set aside. Thereafter a Company was formed, who erected the gas-works. Even to this there was opposition—some contending that the gas-works would be a blot upon the landscape, and others that, there being several Town Councillors in the Company, the interests of the community would be imperilled. The agreement mentioned was entered into, under which the Company undertook to supply gas for public lighting at a price not exceeding 5s. per 1000 cubic feet. This undertaking has been adhered to; but the price of gas to the public has been 6s. per 1000 cubic feet, which is from 1s. to 1s. 6d. higher than was anticipated at the time the Council were contemplating the erection of gas-works. I am satisfied that the Directors of the Company have acted throughout in a public spirited manner; and I fear that the opposition has its origin more in envy than in any desire for the public benefit. The tone of the two communications referred to lead to this conclusion. I suppose the community understand all this. At all events they were not influenced by the alarmist statement in Mr. Crichton's letter that the cost of the gas undertaking would be £50,000. Possibly the addition of a 0 was a typographical error; but the statement was made all the same, and it may have had its effect upon the poll, by turning some of the electors away from the ranks of the opposition, thereby proving a weakness, instead of a strength, to the opponents of the transfer.

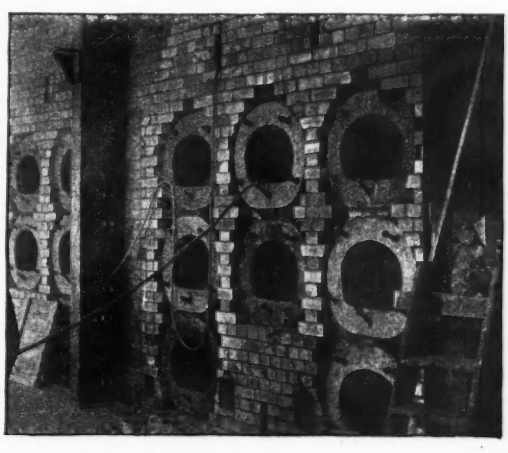
Another case of rejection of a proposed transfer falls to be recorded from Maybole. The Town Council had adopted the Act; but a poll was demanded. It took place on Tuesday last, and resulted in 255 voting in favour of adoption, and 266 against. The transfer will, of course, not go on. There are 1028 voters on the roll; so that less than one half took part in the poll.

The Lochwinnoch Gas Company have paid a dividend at the rate of 5 per cent. for the past year.

The Corporation of Falkirk had before them last week a question as to the equipment of the retort-house of their new gas-works. In the minutes of the Committee, it was stated that Mr. M'Crae, the Engineer, had reported to them the results of his visit to the Derby Gas-Works, and as to the tests made there with Scotch coal in the De Brouwer charging and discharging machines. It was moved in Committee that, before a decision was come to on the subject of the machines, a consulting engineer should be employed to advise them. This proposal was lost by seven votes to three in favour of a motion that the De Brouwer method of charging and discharging retorts be adopted. A further motion was made in Committee that, before coming to a decision, offers be obtained for the De Brouwer and the West machines; but the recommendation of the Committee was again carried—this time by the casting vote of the Convener. In the Council, Treasurer Lochhead moved that offers be invited for the De Brouwer and the West machines. He understood that the West machine was a very good one, and that it had been introduced into a good many gas-works all over the country. Bailie Mitchell said they were all quite conversant with the West machines, and it was on the principle of economy that they had resolved to go in for the De Brouwer machines. The West machines were good enough for works five or six times the size of theirs; but when the De Brouwer machine suited their requirements, they did not require to go in for West's. After some further discussion, it was resolved, by seven votes to four, to adopt the De Brouwer apparatus.

The trial was concluded in Edinburgh to-night of an action which was brought by Mr. R. A. Rennie, solicitor, of Glasgow, against Bailie Bilsland, of that city, in which £1000 was asked as damages for alleged slander. The allegation was that in December, 1903, when a Sub-Committee of the Gas Committee were considering as to the filling up of four vacancies in the management of the Gas Department, Bailie Bilsland, in the City Chambers, received a telephone message which contained reflections upon the character of Mr. Rennie and others, including Mr. Andrew Macleod, who had been recommended by the Sub-Committee to the post, and has since been appointed Manager of the Dawsholm station of the gas undertaking. The message was understood to be intended to affect Mr. Macleod's candidature. Bailie Bilsland, not being a member of the Sub-Committee in charge of the subject, communicated the message to Mr. Willock, who was. Mr. Willock sent for Mr. Macleod, and laid the whole matter before him. He stated in the witness box that he was satisfied that there was no truth in the allegations—and Mr. Macleod, as we know, obtained the appointment. The story of the telephone message afterwards became

JULY 25th, 1904.



OCTOBER 15th, 1904.

12 Beds of Inclined Retorts, Erected by us, the whole of the Work being done by our own Men.

RESULTS GUARANTEED.

NEW CONVEYOR CO., LTD., SMETHWICK.

current in the Maryhill district, where Mr. Rennie resides. An action was brought against the man who sent the telephone message, by one of the men who were mentioned in it; but it failed, on account of dates having been given erroneously. Then Mr. Rennie brought the present action against Bailie Bilsland, as the disseminator of the alleged slander. After a two days' hearing before Lord Kinnear and a Jury, a verdict has been returned in favour of the pursuer, with damages assessed at £150; but the Jury have added a rider to the effect that the defender acted in *bonâ fide*, and without malice. The defence was that the defender, in what he did, was acting within his duty as a Gas Commissioner, and was privileged. The region of the law is a mysterious one; but it looks as if the verdict were one for the defender. I expect, at least, that this will be maintained when the verdict comes before the court to be applied.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Dec.* 31.

Sulphate of Ammonia.

Throughout the week the market has been of a holiday character, and the business has consisted mainly of the sale of parcels which makers have been anxious to clear out before the end of the year. Prices have consequently been rather irregular, but at the close the quotations are £12 12s. 6d. per ton f.o.b. Hull, £12 15s. per ton f.o.b. Liverpool, and £12 17s. 6d. per ton f.o.b. Leith. Dealers have been inquiring with the view of picking up larger lines at a decline on current prices, but they have not met with much success, those having any important quantity to dispose of preferring to wait the turn of the year. There has also been inquiry of the same character for delivery over the Spring months; but no important business has been reported up to the time of writing.

Nitrate of Soda.

This article is steady, and spot prices remain 11s. to 11s. 3d. per cwt., according to quality.

LONDON, *Dec.* 31.

Tar Products.

Markets have been very quiet during the past week; and there has really been scarcely any business doing, which is, of course, owing to its being the holiday season. No transactions in anthracene have taken place; but it is reported that there was an inquiry for some considerable quantity of "A" quality, 40 per cent., for delivery all over next year. London makers, however, declined to offer at anything under 2¾d., at which price consumers were not at all inclined to contract. Benzol continues quiet. Small sales of 90 per cent. are reported at 10¼d. to 10½d. London; while as regards 50-90 per cent., there is no actual business doing. Toluol and solvent naphtha are both quiet; and values remain practically the same as during last week. In pitch, so far as London producers are concerned, they still quote 38s. to 38s. 6d.; but dealers are undoubtedly offering to sell at under these figures. There is still a fairly good inquiry from South Wales for delivery all over next year; but consumers' ideas of value are very much under those of makers and dealers over this period. Business is reported to have been done in Belgium for delivery over the first six months of the year at slightly lower prices than those which were recently ruling; but just at present there appears to be a great deal of uncertainty as to whether consumers have covered in their requirements for the next three or four months. It is not, however, at all probable that there will be any business doing until after the New Year, when probably some of the largest consumers will consider the question of supplies over the first six months. There is not much business doing in carbolic acid, and consumers still decline to purchase except for delivery over the first two or three months of next year. The nominal value is still 2s. 3d. for 60's; but as a rule consumers decline to pay this price unless for immediate delivery. Crystals are certainly steady; and the market shows signs of improvement. Should any further rise in value take place, it should certainly improve the position of crude. Creosote is still very quiet, both in London and the Provinces. Some London makers still ask 1⅞d. to 2d.; but it appears pretty certain that business has been done at considerably under these figures at no distant date. In the North, there does not seem to be very much demand, especially in the Yorkshire district, where makers appear to be decidedly willing to offer over the next three months. At present, however, consumers only offer 1¼d.; while makers as a rule will not consider business at under 1⅜d.

The average values during the week were: Tar, 18s. to 22s. Pitch, London, 37s.; east coast, 34s.; west coast, 33s. 6d. to 34s. Benzol, 90 per cent., 10¼d. to 10½d.; 50-90 per cent., 8¾d. to 8½d. Toluol, 7½d. Crude naphtha, 3¾d.; solvent naphtha, 8½d. to 9d.; heavy naphtha, 10d. Creosote, London, 1½d. to 1 9/16d.; North, 1¾d. to 1 5/16d. Heavy oils, 2¼d. to 2¾d. Carbolic acid, 60 per cent., 2s. 2d. to 2s. 3d. Refined naphthalene, £4 to £8 10s.; salts, 20s. to 21s. Anthracene, "A" quality, 1½d. to 1⅝d.; "B" quality, unsaleable.

Sulphate of Ammonia.

Markets have been decidedly quiet during the past week; but this is not unusual at this time of year. The price at Beckton may be taken as £13 7s. 6d. in any position; but there is really no business doing. South Metropolitan still quote £13 10s. for January delivery on their own special conditions. Buyers, however, do not at present show any inclination to pay this figure. In Hull, business has been done at £12 15s. to £12 16s. 3d. during the past week for shipment early in January. Makers at Leith still ask £13 for January shipment; but there is no business to report at this port for either prompt or forward delivery.

CARBURETTED WATER-GAS APPARATUS

Merrifield—Westcott—Pearson Patents.

The Economical Gas Apparatus Construction Co., Ld.

W. H. PEARSON, Chairman.
W. H. PEARSON, Junr., Deputy-Chairman.
J. T. WESTCOTT, Manager.
L. L. MERRIFIELD, M.Inst.M.E., Engineer.

London Offices: 19, ABINGDON STREET, WESTMINSTER, S.W.
American Offices: TORONTO. TELEGRAPHIC ADDRESS: "CARBURETED, LONDON."

CARBURETTED WATER-GAS ENGINEERS.

The above Company have erected since 1893, or are now erecting, their Universal Type of Carburetted Water-Gas Plant at the following Gas-Works:—

	Cub. Ft. Daily.		Cub. Ft. Daily.		Cub. Ft. Daily
BLACKBURN	1,250,000	ST. CATHERINES (Remodelled)	250,000	TONBRIDGE	300,000
WINDSOR ST. WORKS, BIRMINGHAM	2,000,000	KINGSTON, PA.	125,000	STRETFORD	500,000
SALTLEY WORKS, BIRMINGHAM	2,000,000	PETERBOROUGH, ONT.	250,000	OLDBURY	300,000
COLCHESTER	300,000	WILKESBARRE, PA.	750,000	TODMORDEN	500,000
BIRKENHEAD	2,250,000	ST. CATHERINES (2nd Cont.)	250,000	SALTLEY, BIRMINGHAM (Third Contract)	2,000,000
SWINDON (New Swindon Gas Co.)	120,000	BUFFALO, N.Y.	2,000,000	YORK (Second Contract)	750,000
SALTLEY, BIRMINGHAM (Second Contract)	2,000,000	WINNIPEG, MAN.	500,000	ROCHESTER (Second Contract)	500,000
WINDSOR ST., BIRMINGHAM (Second Contract)	2,000,000	COLCHESTER (Second Contract)	300,000	NEWPORT (MON.)	250,000
HALIFAX	1,000,000	YORK	750,000	TOKIO, JAPAN	1,000,000
TORONTO	250,000	ROCHESTER	500,000	PERNAMBUCO (Brazil)	125,000
OTTAWA	250,000	KINGSTON, ONT.	300,000	MALTON	150,000
LINDSAY (Remodelled)	125,000	CRYSTAL PALACE DISTRICT	2,000,000	DULUTH, MINN. (2nd Cont.)	300,000
MONTREAL	500,000	DULUTH, MINN.	300,000	BROCKVILLE (ONT.)	250,000
TORONTO (Second Contract Remodelled)	2,000,000	CATERHAM	150,000	SMETHWICK	500,000
BELLEVILLE	250,000	LEICESTER	2,000,000	GRAVESEND	300,000
OTTAWA (Second Contract)	250,000	ENSCHEDE (HOLLAND)	150,000	NEWPORT MON. (Second Contract)	250,000
BRANTFORD (Remodelled)	200,000	BUENOS AYRES (RIVER PLATE CO.)	700,000	TORONTO (Third Contract)	750,000
		BURNLEY	1,500,000	TORONTO (Fourth Contract)	1,000,000
		KINGSTON-ON-THAMES	1,750,000	MONTREAL, ONT. (2nd Cont.)	1,800,000
		ACCRINGTON	500,000	HAMILTON, ONT.	400,000

LEEDS, 1,800,000 C. Ft. LEICESTER (2nd Cont.), 1,000,000 C. Ft. NEWCASTLE-ON-TYNE, 1,800,000 C. Ft.

AND, IN ADDITION, 5,300,000 CUBIC FEET DAILY; also Coal-Gas Plants at NELSON, B.C., CHATHAM, BERLIN, NAPANEE, OWEN SOUND, CALGARY, and WINNIPEG.

COAL TRADE REPORTS.

Lancashire Coal Trade.

The result of the recent fogs was disastrous to the coal trade, inasmuch as the railway system in its connection with the coal pits was almost completely blocked. What waggons were laden could not be got away, neither, of course, could empties be returned to the colliery sidings. Owing to the severe weather, orders for coal for house, gas making, and boiler had increased, and customers were pressing for delivery. The position was very awkward for all parties concerned; but it has now happily been remedied. Yesterday and to-day (Tuesday) the mines are closed for the New Year's holiday. The demand for best slack has increased, and prices have hardened; while for all other descriptions great firmness prevails. The quotations are: Best house coal 13s. to 14s. per ton at the pit, secondary 11s. to 12s., common 9s. to 10s., steam and forge coal 8s. 6d. to 8s. 9d. ordinary qualities, and 8s. to 8s. 3d. common. Engine fuel: Best slack 6s. 6d. to 7s., secondary 5s. 6d. to 6s. 3d., and common 4s. 3d. to 5s.

Lancashire Iron and Coal Trades during the Past Year.

While the iron trade has been of an indifferent character during the past twelve months, the coal trade has been worse, accompanied by a longer continued spell of short time than has been the case for some years past. True, the last month or two has witnessed a marked improvement in these important trades; and the prospects are decidedly better. The engineering branch, electrical work, tool making, &c., are also brisker; and makers of textile machinery, under the influence of renewed activity in the cotton and woollen districts, are participating in this improvement. Pig iron for foundry use is 1s. to 2s. per ton better. Thousands of tons were arriving at the Manchester Docks early last year from the United States, further handicapping local producers; but we hear nothing of this now. America is using her own make, both of iron and steel; and there are reports of the buying of English pig iron for shipment to the States. Steel billets continue to arrive in smaller quantities from Germany, but at such an approximation to English prices as to give English makers a better chance than they have had during the past year. Finished iron has been in quite consumptive demand only for the previous ten months, but now shows signs of improvement in sympathy with other departments.

In the coal trade, up to March there was a fair demand; but about May the Manchester Association created a mild sensation by dropping the price 10d. per ton. This example was promptly followed by outside coalowners, where they found themselves in competition with Manchester. With this exception, prices have remained practically on the same level throughout; but any improvement in demand has been brought about by the revival in the cotton trade referred to above. In July last, a meeting of the Conciliation Board was held in London, when Lord James of Hereford gave his casting vote in favour of a 5 per cent. reduction in miners' wages, which was loyally accepted by the men. In the summer, contracts for gas coal were made at about 3d. per ton reduction, and for locomotive use at from 3d. to 6d. per ton under the previous year.

Northern Coal Trade.

There is now a better demand for coal in the north-east—better, that is, relatively to the output. The severe weather has increased the consumption; and as this has occurred at the time when the holidays have lessened the production, the stocks have decreased. In the steam coal trade, there is still some dulness; but the price of best Northumbrian steams is about 9s. per ton f.o.b., second-class steams are 8s., and steam smalls are from 4s. to 4s. 9d. Some of the collieries, however, are still working short time. In the gas coal trade, there is now a pressing demand, which taxes the output of the chief collieries. Durham gas coals are quoted from 7s. 9d. to 8s. 3d. per ton f.o.b. generally, but with an occasionally higher price asked by collieries that are very favourably situated. No contracts of moment have been reported for the past few days. In coke, the market is brisk, and prices are higher; and this affects the market for gas coke, good qualities of which are offered for export over next season at about 13s. 3d. per ton f.o.b. in the Tyne.

Scotch Coal Trade.

The last market for 1904 closed with Saturday. It was characterized by a fair demand, with prices ruling at about the previous week's rates. Collieries are well booked up with orders; so that the prospect continues to be a little more hopeful than it was during the autumn of last year. No official notice is taken of the coal market in the first week of January; so next week will be blank. The prices quoted last week are: Main 7s. 3d. to 7s. 6d. per ton f.o.b. Glasgow, ell 8s. to 9s., and splint 8s. 9d. to 9s. The shipments for the week amounted to 226,229 tons—a decrease of 7450 tons upon the preceding week, but an increase of 9274 tons upon the corresponding week of last year. For the year to date (the full figures for 1904 will not be available till to-day), the total shipments have been 11,562,224 tons—an increase of 424,217 tons upon the corresponding period of last year.

Owing to the increased use of gas for culinary purposes at Southport, there was consumed between the 31st of March last and the close of the year about 10 million cubic feet more than in the same period of 1903.

Messrs. Joseph Taylor and Co. have secured an order from the Durham Coke and Bye-Products Company for an open type of saturator for fishing; also one for a solid-plate lead saturator, in connection with the plant about to be erected for the Oriental Gas Company at their Calcutta works. The firm have also obtained a repeat order for a solid plate-lead double ammonia-pipe saturator from the Stafford Coal and Iron Company, Limited, Stoke on-Trent.

S&P

MANCHESTER
M&N
NOTTINGHAM

TRADE NOTES.

An Artistic and Useful Pamphlet on Gas.

In previous issues of the "JOURNAL," reference has been made to an attractive pamphlet issued by the Commercial Gas Company, bearing the title, "The Light that Never Failed." In the compass of 16 small pages, it sets forth, in terse, but convincing, language, the advantages of gas for lighting, manufacturing, cooking, heating, ventilation, and the production of power; and it shows how these may be secured by residents and people engaged in business at the East End of London by availing themselves of the Company's assistance. The discounts and special terms offered are given at the end of the book, which has been found so useful that it has reached a third edition.

West's Coke-Conveyors.

The Directors of the Imperial Continental Gas Association have decided upon a complete installation of West's coke conveying machinery at their Hanover Gas-Works. This is to be introduced into the retort-house in which it was resolved some little time ago to introduce West's compressed-air stoking machinery; and the contract comprises longitudinal conveyors the whole length of the house, and a cross conveyor to the coke yard. The stoking machinery ordered in September last is in position, and is soon to be put into operation.

Diaries and Calendars for the New Year.

In addition to the diaries and calendars for 1905 which were noticed in the "JOURNAL" last week, others have reached us. Messrs. F. C. Sugden and Co., of Leeds, have sent one of their little pocket-books which are of special use to gas managers, as at the end of each week there is a form for entering details of carbonizing and consumption. Descriptions of the firm's retort-settings are given in front of the diary, and some tables and general information at the end. An effective card calendar, showing a month at a glance, has been sent by Messrs. Peckett and Sons, of Bristol, whose speciality is tank locomotives. Messrs. Thomas Duxbury and Co., of Manchester, have forwarded a paper calendar, containing two months on a sheet, with space for memoranda opposite each day. Messrs. John E. Williams and Co., of the Victoria Paint Works, Manchester, have for some years issued quarterly diaries, with tables and useful memoranda; and we have received the one for the first quarter of the current year.

A Water Famine at Pontefract.—A very great amount of inconvenience has been experienced at Pontefract and the neighbourhood by the complete breakdown of the pumping machinery at the Roall Water-Works, 7 miles away. Some few weeks ago, the piston-rod of one of the pumps broke; and this laid the whole of the work on the second set of pumps, which ultimately collapsed. The water in the reservoirs was soon exhausted; and the people had then to rely practically on private sources and two public pumps. Two or three days later, a small pulsometer was in working order, and a restricted supply became available; but meanwhile many service-pipes had frozen up. The higher parts of the town were served by means of the Corporation water-carts.

Gas Explosion at St. Leonards.—A serious explosion occurred last Wednesday at St. Leonards, by which the Royal Hotel, King's Road, suffered considerable damage, though, fortunately, nobody was hurt. The cause was understood to be an escape of gas from a chandelier in the private sitting-room and office of the proprietor, Mr. W. Snape, situate on the ground floor. This room was closed overnight, and when the barman and barmaid came downstairs about seven o'clock in the morning, everything seemed safe. While the barman was going about his duties, there was a flash of flame and a loud report, and the barmaid, who happened to have just reached the foot of the stairs, was carried along the passage for a considerable distance. The interior of the office was wrecked, and the fire which followed the explosion did a great deal of injury to the furniture and stock-in-trade of the proprietor.

Hurtwood Water Company, Limited.—The first ordinary general meeting of this Company was held at Shere, on Friday, the 23rd ult.—Mr. F. E. J. Blackburne in the chair. The Directors reported that the whole of the work contemplated by the Company had been completed. The reservoir on Holmbury Hill had been constructed, the mains to Holmbury St. Mary and Peaslake laid and tested, and the machinery at the pumping-station at Netley Mill had been working satisfactorily since June. Owing, however, to doubts cast upon the suitability for a public supply of the water from the well sunk on the north side of the Tillingbourne, serious delay had occurred in the distribution of water to the public; and the Company were advised to sink another on the south side of the stream, entailing considerable additional expense. This well had been completed, and yielded an abundant supply of water of exceptional purity. Samples had been submitted to Dr. Rideal and Dr. Pierce (the Medical Officer of Health for the district); and, the District Council having granted the necessary certificate, the public would be able to obtain from the 1st of January, a constant supply of water. The Directors expressed hope that all those to whose doors the water had been brought would avail themselves of it. The report was unanimously adopted.

Rivington Arbitration Award.—Our readers will doubtless remember that the award of Mr. R. E. Middleton in the arbitration proceedings between the Corporation of Liverpool and Mr. W. H. Lever has given rise to much dissatisfaction among the members of the Council, especially those who constitute the Water Committee. This feeling has culminated in a determination on the part of the latter not to accept the award, and to resist any attempt to force them to submit to it. The result of this attitude has been that Mr. Lever's solicitors have issued a writ against the Corporation in the Chancery Division of the High Court of Justice; and the action is to be heard by Mr. Justice Buckley. Mr. Lever claims: (1) For specific performance of the agreement for the sale by him to the Corporation of the land in question, as constituted by the notice to treat, dated Nov. 17, 1903, whereby they intimated that they required to take the land and hereditaments for the purposes authorized by the Liverpool Corporation Act, 1902, and by the award of Mr. Middleton fixing the purchase money and compensation at £138,000; (2) the payment of the amount of the award with interest at the rate of 4 per cent. per annum; (3) the payment by the defendants of the plaintiff's costs in the arbitration proceedings; and (4) damages. It is thought locally that the Committee will give way.

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 20.

Issue.	Share.	When Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
500,000	10	Oct. 13	10½	Alliance & Dublin 10 p.c.	14—15	+½	5 0 0
100,000	10	,,	7½	Do. 7 p.c.	20½—21½	..	4 17 8
200,000	5	Nov. 11	6½	Bombay, Ltd.. . . .	6—6½	..	5 0 0
140,000	5	,,	6½	Do. New, £4 paid	4½—5	..	5 4 0
50,000	10	Aug. 31	14	Bourne- | 10 p c. . .	29—30	..	4 13 4
251,800	10	,,	7	mouth Gas | B 7 p.c. .	15½—16½	..	4 4 10
53,200	10	,,	6	and Water | Pref. 6 p.c.	14½—15½	..	3 17 5
380,000	Stk.	Aug. 12	12	Brentford Consolidated	250 255	+5	4 14 1
300,000	,,	,,	9	Do. New . . .	190—195	+3	4 12 4
50,000	,,	,,	5	Do. 5 p.c. Pref. .	130—135	+5	3 14 1
206,250	,,	Dec. 15	4	Do. 4 p.c. Deb. .	105—108	..	3 14 1
220,000	Stk.	Sept. 15	11	Brighton & Hove Orig.	227—232	+5	4 14 10
246,320	,,	,,	8	Do. A. Ord. Stk. .	167—172	+4	4 11 0
420,000	20	Sept. 29	10	British	40½—41½	+½	4 16 5
100,000	Stk.	Aug. 12	6	Bromley, Ord. 5 p.c. .	117—122	..	4 18 4
165,700	,,	,,	4½	Do. do. 3½ p.c. .	92—95	..	4 13 9
500,000	0	Oct. 13	7	Buenos Ayres (New) Ltd.	11½—11¾	..	5 19 2
250,000	Stk.	Dec. 30	4	Do. 4 p.c. Deb. .	93—95*	..	4 4 3
150,000	20	July 14	8½	Cagliari, Ltd.	24—26½	..	6 6 11
100,000	10	Sept. 29	10	Cape Town & Dis., Ltd.	15½—16	+½	6 5 0
100,000	10	Oct. 27	4½	Do. 4½ p c Pref . .	9½—9¾	..	4 12 4
50,000	50	Nov. 2	6	Do. 6 p.c. 1st Mort.	51—53	..	5 13 2
50,000	Stk.	Dec. 30	4½	Do. 4½ p.c. Deb. Stk	100—102*	+1½	4 8 3
1,375,000	Stk	Aug. 31	5 5/16	Commercial 4 p c Stk. .	117—120	+4½	4 6 8
560,000	,,	,,	5	Do. 3½ p.c. do. .	113—116	+3	4 6 2
450,000	,,	Dec. 15	3	Do. 3 p c. Deb. Stk.	85—87	..	3 9 0
800,000	Stk.	,,	6½	Continental Union, Ltd.	114—117	..	5 11 1
200,000	,,	,,	7	Do. 7 p c. Pref.	140—145	+4	4 16 7
486,090	10	July 14	11	European, Ltd. . . .	20½—21½	+½	5 2 4
354,060	10	,,	11	Do. £7 10s. paid	14—15	..	5 10 0
15,243,200	Stk.	Aug. 12	4 1/16	Gas- | 4 p.c. Ord. . .	101—104	+3/8	4 4 7
2,600,000	,,	,,	3½	light | 3½ p.c. max. .	52—94	+1	3 14 6
3,709,735	,,	,,	4	and | 4 p.c. Con. Pref.	109—111	..	3 12 1
4,193,975	,,	Dec. 15	3	Coke | 3 p.c Con. Deb.	86—84	..	3 8 2
258,740	Stk.	Sept. 15	5	Hastings & St. L. 3½ p.c.	100—103	+9	4 17 1
70,000	10	Sept. 29	11	Hongkong & China, Ltd.	16—17	+1	6 9 5
3,800,000	Stk,	Nov. 11	10	Imperial Continental .	210—212	+4	4 14 4
473,600	Stk.	Aug. 12	3½	Do. 3½ p.c. Deb. Red.	96—98	..	3 11 4
175,036	Stk.	Aug. 31	6	Lea Bridge Ord. 5 p.c. .	118—123	+1	4 17 7
561,000	Stk.	Aug. 31	10	Liverpool United A . .	219—221	+1	4 10 6
718,100	,,	,,	7	Do. do. B .	160—162	+1	4 6 5
306,083	,,	Dec. 30	4	Do. do. Deb. Stk.	105—108*	..	3 14 1
75,000	5	Dec. 15	5	Malta & Medn., Ltd. .	4—4½	..	5 11 1
560,000	100	Oct. 1	5	Met. of | 5 p.c. Deb..	102—104	..	4 16 2
250,000	100	,,	4½	Melbourne | 4½ p.c. Deb.	100—102	..	4 8 3
541,920	20	Nov. 11	3½	Monte Video, Ltd. . .	10—11	..	6 7 3
1,515,892	Stk.	July 29	4½	Newc'tle & G'tesh'd Con.	109—110	..	4 1 10
406,025	Stk	Dec. 30	3½	Do. 3½ p.c. Deb.	90—91*	..	3 16 11
15,000	10	Aug. 31	10	North Middlesex 10 p.c.	19½—20½	..	4 17 7
52,940	1	,,	7	Do. 7 p c.	13½—14½	..	4 16 7
300,000	Stk.	Nov. 30	8	Oriental, Ltd. . . .	147—150	+1½	5 6 8
600,000	5	Sept. 15	7	Ottoman, Ltd. . . .	5½—6½	..	5 12 0
235,005	Stk.	—	6½	Plym'th & St'house 5 p.c.	—	..	—
398,490	5	Apl. 28	5	Primitiva Ord. . . .	5¼—5¾	..	4 6 11
796,980	5	July 28	5	Do. 5 p.c. Pref. .	4⅝—5¼	..	4 15 3
488,900	100	Dec. 1	4	Do. 4 p.c. Deb. .	93—95	..	4 4 5
851,070	10	Oct. 13	7	River Plate Ord. . . .	1 13/16—1 15/16	+1/16	5 14 3
300,000	Stk.	Dec. 30	4	Do. 4 p.c. Deb. .	94—96*	+1	4 3 4
250,000	10	Sept. 15	6	San Paulo, Ltd. . . .	12—12½	..	4 16 0
70,000	50	June 29	5	Do. 5 p.c. Deb. .	5—55	..	4 10 11
135,000	Stk.	Sept. 15	10	Sheffield A	238—240	..	4 3 4
209,984	,,	,,	10	Do. B	237—239	..	4 3 8
523,498	,,	,,	10	Do. C	236—238	..	4 4 0
123,998	Stk.	Sept 29	5	Shrews' ury Ord. 5 p.c.	104½—107½	..	4 13 0
70,000	10	,,	11	South African	16—17	..	6 9 5
6,250,000	Stk.	Aug. 12	5½	South Met., 4 p.c. Ord.	132—134	+2	4 2 1
1,832,700	,,	July 14	3½	Do. 3 p.c. Deb.	89—91	..	3 5 11
575,000	Stk.	Aug. 31	5½	S'th Suburb'n Ord. 5 p.c.	123—126	+1	4 7 4
60,000	,,	,,	5	Do. 5 p.c Pref. . .	125— 30	+5	3 16 11
112,533	,,	July 14	5	Do. 5 p c. Deb. Stk.	133—138	..	3 12 6
502,310	Stk.	Nov. 11	5	Southampton Ord . .	105—107	..	4 13 6
87,950	,,	—	4	Do. 4 p.c. Deb.	—	..	—
120,000	Stk.	Aug. 31	6¼	Tottenham | A 5 p c. .	123—128	+1	4 17 8
325,520	,,	,,	4¾	and | B 3½ p.c. .	97—100	..	4 15 0
115,000	,,	Dec. 15	4	Edmonton | 4 p.c. Deb.	102—105	..	3 16 2
182,380	10	,,	8	Tuscan, Ltd.	8⅛—9⅛	+¼	8 13 0
149,900	10	July 1	5	Do. 5 p c. Deb. Red.	96—98	..	5 2 0
50,000	Stk.	Aug. 31	7½	Wands- | A 5 p c. . .	160—165	..	4 14 11
255,636	,,	,,	6¼	worth | B 3½ p.c. . .	130—135	..	4 12 7
51,293	,,	,,	5 1/16	and | C 3½ p.c. . .	110—115	..	4 13 6
57,564	,,	Dec. 30	3	Putney | 3 p c Deb. Stk.	77—82*	+½	5 13 2
745,872	,,	Aug. 12	5	West Ham 5 p.c. Ord.	100—102	+1	4 18 0
85,000	,,	,,	5	Do. 5 p.c. Pref. . .	122—127	+2	3 15 9
160,000	,,	Dec. 30	4	Do. 4 p.c. Deb. Stk.	101—106*	..	3 15 6

Prices marked * are Ex div.

Portadown and Banbridge Water Scheme.—An inquiry has just been held at Portadown by Mr. P. C. Cowan, on behalf of the Local Government Board, into an application by the Portadown and Banbridge Joint Water Board for a loan of £65,000 to provide a water supply for the district; the proposed source being the Shimna River, in the Mourne Mountains. Mr. W. Wilson, the Clerk to the Board, explained that the borrowing powers of the joint district were £72,550; but they were reduced by outstanding loans to £67,383. The outstanding loans, however, were not incurred by the Board. Details of the scheme were furnished by Mr. J. H. Swiney and Mr. R. H. Dorman. There was no opposition. Subsequently a special meeting of the Joint Board was held, at which a resolution was passed asking the Local Government Board to sanction a loan of £70,000 to carry out the work.

Water Schemes in the Peak District.—Although the district of Chinley is growing rapidly, it has no public water supply; but the Chapel-en-le-Frith District Council have received the sanction of the Local Government Board to expend £28,000 in the purchase of the three water-works at Dove Holes and Chapel-en-le-Frith, and the construction of works for Chinley and Bugsworth. The district will then be properly served, all the undertakings of local Companies having been bought up. At the meeting of the Council last Wednesday, they approved of the expenditure necessary for acquiring the concern of the Dove Holes Water Company; and it was decided that the purchase money (£6750) should be apportioned as follows: Chapel-en-le Frith, £3114; Wormhill, £3636. The Clerk was instructed to negotiate loans of £13,261 and £7938 required for carrying out the Chapel-en-le-Frith and Chinley water scheme.

The Wrexham Gas Company have opened a fittings department, in which they are bringing under the notice of the inhabitants all the newest forms of incandescent lighting appliances, gas-stoves, &c. As the electric light undertaking of the Corporation does not appear to be working very satisfactorily, the burgesses might do well to pay a visit to the Company's show-rooms, and see what gas is capable of doing.

The fifth annual meeting of Metropolitan Gas-Meters, Limited, was held last Friday at Winchester House, E.C. In moving the adoption of the Directors' report, the Chairman (Mr. L. R. de Fonblanque) expressed regret that he had to record a check to the constant increase which had marked the business for the preceding four years; the hopes entertained as to the revival of trade not having been fulfilled. Large numbers of operatives, who were the principal users of prepayment meters, were out of employment; and as their wage-earning powers decreased, so did their patronage of the meters. There was, therefore, absolutely no question about the cause which had brought about the decrease in their sales, which was due entirely to the fact that the demands of the gas companies in the North of England were very much less than they had been. In the South, where the same conditions did not obtain, the Company had done better than they did last year. Had it not been for this, the results would have been considerably worse than they were. Referring to the accounts, he said the items were generally much the same as before; and he assured the shareholders that liberal depreciation had been written off the stocks and machinery. Questions having been invited, a shareholder moved that the Company be wound up forthwith under the supervision of the Court. The motion, however, was not seconded; and the report was adopted.

WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Situations Vacant.

SUPERINTENDENT. Sheffield Gas Company. Applications by Jan. 12.
DRAUGHTSMAN (LEADING). Drakes Limited, Halifax.
DRAUGHTSMEN. No. 4315.
DRAUGHTSMEN. Jenkins and Co., Retford.
GENERAL FOREMAN. South Staffordshire Mond Gas Company.
SHOW-ROOM. No. 4317.

Pupil Required. No. 4316.

Situation Wanted.

INCANDESCENT MANTLE MANUFACTURE. No. 4313.

Plant for Sale.

ACETYLENE PLANT. Working Men's Club, Barnsley.
PURIFIER. Knowle Gas Company.
STATION GOVERNORS. R. Dempster and Sons, Elland.
SULPHATE SATURATOR. No. 4314.

Stocks and Shares.

GUILDFORD GAS COMPANY. Jan. 17.
LOWESTOFT WATER AND GAS COMPANY. Jan. 17.
MAIDENHEAD GAS COMPANY. Jan. 17.
NEWCASTLE AND GATESHEAD WATER COMPANY. Jan. 17.
READING GAS COMPANY. Jan. 16.
REDHILL GAS COMPANY. Jan. 19.
SOUTHGATE AND DISTRICT GAS COMPANY. Jan. 17.

TENDERS FOR

Coal.
COPENHAGEN LIGHTING DEPARTMENT. Tenders by Jan. 16.

Fire-Clay Goods.
BIRKENHEAD GAS DEPARTMENT. Tenders by Jan. 12.
ROCHDALE GAS DEPARTMENT. Tenders by Jan. 11.

Gasholder.
COVENTRY GAS DEPARTMENT. Tenders by Jan. 16.

Purifier Grids.
ROCHDALE GAS DEPARTMENT. Tenders by Jan. 11.

Re-Tubing Condenser.
RIPON GAS DEPARTMENT. Tenders by Jan. 18.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

TERMS OF SUBSCRIPTION to the "JOURNAL."

United Kingdom: One Year, 21s.; Half Year, 10s. 6d.; Quarter, 6s. 6d. Payable in Advance. If credit is taken, the charge is 25s. a year.

Abroad (in the Postal Union): £1 7s. 6d., payable in Advance.

Subscribers who desire to avail themselves of the reduction in the Subscription by paying in advance for the Year 1905, are reminded that this can only be done during the current month.

All Communications, Remittances, &c., to be addressed to WALTER KING, 11, BOLT COURT, FLEET STREET, LONDON, E.C.

COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.

Wanted, For Sale, and Tender Advertisements, Six Lines and under, 3s.; each additional Line, 6d.

Telegrams: "GASKING, LONDON." Telephone: P.O. 1571a Central.

OXIDE OF IRON.

O'NEILL'S OXIDE has a larger annual sale than all other Oxides combined.

SPENT OXIDE purchased in any district.

GAS PURIFICATION & CHEMICAL CO., LD.
JOHN WM. O'NEILL, Managing Director,
PALMERSTON HOUSE, LONDON, E.C.

WINKELMANN'S
"VOLCANIC" FIRE CEMENT.
Resists 4500° Fahr. Best for GAS-WORKS.
ANDREW STEPHENSON, 182, Palmerston House, Old Broad Street, London, E.C. "Volcanism, London."

GAS TAR wanted.
BROTHERTON AND CO., LTD., Tar Distillers. Works: BIRMINGHAM, GLASGOW, LEEDS, LIVERPOOL, AND WAKEFIELD.

THE KEITH LIGHT.
OVER 1600 INSTALLATIONS IN DAILY USE.
SEE illustrated advertisement in next week's issue.
JAMES KEITH AND BLACKMAN CO., LTD., 27, Farringdon Avenue, LONDON, E.C.

AMMONIACAL Liquor wanted.
BROTHERTON AND CO., LTD., Ammonia Distillers. Works: BIRMINGHAM, GLASGOW, LEEDS, LIVERPOOL, AND WAKEFIELD.

J. & J. BRADDOCK (Branch of Meters Limited), Globe Meter Works, OLDHAM, and 45 & 47, Westminster Bridge Road, LONDON, S.E.
WET AND DRY GAS-METERS, PREPAYMENT METERS, STATION METERS, AND GOVERNORS.
REPAIRS RECEIVE PROMPT ATTENTION.
Telephones: 254 Oldham, and 2412 HOP, London.
Telegrams:—
"BRADDOCK, OLDHAM," and "METRIQUE, LONDON."

DUTCH OXIDE OF IRON.

THE First Dutch Bog Ore Co., Ltd. (Eerste Hollandsche Yzererts Maaty), ROTTERDAM.
General Manager (for England and Wales)—
CHARLES E. FRY, LEAMINGTON; and at Tower Chambers, Brown Street, MANCHESTER.
London Managers—
E. PADFIELD & CO., 96-98, Leadenhall Street, LONDON, E.C.
General Manager (for Scotland)—
J. B. MACDERMOTT, 11, Bothwell St., GLASGOW.

GASHOLDER PAINTING.
PAINTING Work for all kinds of Gas- Works Plant undertaken by contract or otherwise.
FREDERICK BOYALL, 31, Regent's Row, Queen's Road, DALSTON, N.E. Established 1850.

SULPHURIC ACID for Sale, specially suitable for making Sulphate of Ammonia.
BROTHERTON AND CO., LTD., Chemical Manufacturers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

OXIDE OF IRON.
NATURAL.)
BALE & CHURCH will be pleased to send Samples and Quotations, and make Offers for SPENT OXIDE.
BALE'S FIRE CEMENT, PAINT, AND GAS COAL, 5, CROOKED LANE, LONDON, E.C.

SULPHURIC ACID.
SPECIALLY prepared for the Manu- facture of SULPHATE OF AMMONIA.
SPENCER, CHAPMAN, AND MESSEL, LIMITED, 36, Mark Lane, LONDON, E.C. Works: SILVERTOWN.
Telegrams: "HYDROCHLORIC, LONDON."
Telephone: 341, AVENUE.

BROTHERTON & CO., LIMITED.
Offices: Commercial Buildings, LEEDS
Correspondence invited.

GLASS SHADES of every description, for all kinds of Interior **GAS LIGHTING.**
Illustrated sheets on application.
JOHN WALSH WALSH,
SOHO AND VESTA GLASS WORKS, BIRMINGHAM.
Telegrams: "VESTA, BIRMINGHAM."
National Telephone: No. 63.
London Show-Room: 4, HOLBORN CIRCUS, E.C.

AMMONIACAL Liquor wanted by JOHN RILEY & SONS, Hapton, near ACCRINGTON.

ROBERT DEMPSTER & SONS, Ltd., Contractor for Complete CARBONIZING PLANTS and every description of GAS APPARATUS and ELEVATING and CONVEYING PLANT, Rose Mount Iron-Works, Elland.

"NUGEPE" CEMENT.

JOHN E. WILLIAMS AND CO.,
VICTORIA PAINT WORKS,
MANCHESTER.
For all Joints in connection with Oil-Gas Plant and Sulphate Plant.
For all Gas Joints.
For all Tar Joints.
For all Ammonia Joints.

HYDRATED OXIDE OF IRON.

PREPARED from Pure Iron.
Twice as Rich as Bog Ore.
Gives no Back Pressure.
The Cheapest in the Market.
Can be Exchanged for Spent Oxide.
Read Holliday and Sons, Ltd., Huddersfield.

COAL GAS TAR wanted.
BEST PRICES GIVEN.
Sharpness Chemical Company, Limited, Sharpness Docks, Glos.

PATENTS AND TRADE MARKS PUBLICATIONS, "MERCHANDISE MARKS ACT, and Decisions thereunder," 1s.; "TRADE SECRETS v. PATENTS," 6d.; "DOCTRINE of EQUIVALENTS, Mechanical and Chemical," 6d.; SUBJECT-MATTER of PATENTS," 6d.
MEWBURN, ELLIS, & PRYOR, Chartered Patent Agents, 70 and 72, Chancery Lane, London, W.C. Telegrams: "Patent London." Telephone: No. 243 Holborn.

SULPHATE OF AMMONIA SATURATORS and all LEAD and TIMBER WORK in Connection with Sulphate Plants.
We guarantee promptness, with efficiency for Repairs.
See our exhibit at the International Gas Exhibition, Earl's Court, Nov. 19 to Dec. 17.
Joseph Taylor and Co., Central Plumbing Works, Bolton.
Telegrams: Saturators, Bolton. Telephone 0848.

INCANDESCENT Mantle Manufacture. Advertiser, with valuable experience of Factory Management and a Thorough Knowledge of the various processes worked throughout Europe, is open to Engagement, preferably in England.
Address No. 4313, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

SPENT OXIDE.

THE South Metropolitan Gas Company are always open to receive OFFERS of SPENT OXIDE.
Chief Office: 709, Old Kent Road, London, S.E.
Telegrams: "Metrogas, London."

OXIDE OF IRON.

WESTBURY OXIDE is now being extensively used for Gas Purification.
For Price and Analysis write to the New Westbury Iron Company, Limited, Westbury, Wilts.

WANTED, Mechanical Draughtsman with knowledge of Structural Ironwork.
Apply, stating Salary and Experience, to W. J. Jenkins and Co., Limited, Engineers, Retford.

VACANCY for a Pupil in Medium-Sized Gas-Works in Yorkshire. Premium required.
Address No. 4316, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

WANTED, a Young Man to Take Charge of a Gas Company's Show-Rooms in West Yorkshire. Preference will be given to one having a Practical Knowledge of Gas Cooking Stoves and Fires, of Incandescent Gas-Burners, both High and Low Pressure, and of Gas-Engines, and able to push sales in these articles.
Apply, stating Age, previous Experience, and Salary required, to No. 4317, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

SHEFFIELD UNITED GAS LIGHT COMPANY.

THE Directors of this Company require a SUPERINTENDENT for their Neepsend Gas-Works. Preference will be given to one who has been used to Regenerative Furnaces and Mechanical Stokers. The maximum make of Gas at this Station is about 8 Million cubic feet per day.
Commencing salary £300 per Annum, with House near the Works, Rent, and Rates free.
Applications, marked "Superintendent," stating Age whether Married or Single, and previous Engagements, to be made by letter only, addressed to the undersigned, must be delivered by post, not later than Thursday, Jan. 12, 1905.
Hanbury Thomas,
General Manager and Secretary.
Commercial Street,
Sheffield, Dec. 22, 1904.

WANTED, a Leading Draughtsman, well up in Coal and Coke Handling Machinery and General Gas-Works Plant. Good Salary to capable man.
Apply, stating Age, Experience, and Salary required, to Drakes Limited, Halifax.

ELEVATING AND CONVEYING MACHINERY.

WANTED, Draughtsman accustomed to Designing and making detail Drawings and Taking out Quantities, &c.
Apply, by letter, stating Age, Experience, and Salary required, to No. 4315, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

MOND GAS-WORKS.

GENERAL FOREMAN.

WANTED a Capable man who has held similar position in Chemical or Gas-Works.
State Age, Experience, where previously employed, and Wages required, to the South Staffordshire Mond Gas Company, Trindle House, Dudley.

WANTED, a firm of Good Repute to undertake the MANUFACTURE and SALE of New Patented Apparatus for making Gas. Good profits yielded. The English Patents will eventually BE SOLD to a firm having suitable machinery for the manufacture of the apparatus.
Address No. 4265, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

GAS and Water Works Supplies and Construction Company, Limited, are open to purchase small or large Gas-Works. Constructors for all Gas and Water Work and Main Laying. All Gas and Water Works Plant and Fittings supplied. Gas and Water Works Financed. Shares and Stock accepted in part payment for Work and Materials supplied. Gas and Water Works Shares and Stock Underwritten and Issued.
London Office, 99, Cannon Street, E.C.

FOR SALE—Three Purifiers, 6 ft. by 6 ft. by 3 ft. 6 in., with 6-inch Centre Valve and Connections, in good condition. Replaced by larger.
Apply to the Knowle Gas Company, nr. Birmingham.

FOR SALE—An Acetylene Gas Plant for 60 Lights. In good working condition. What offers?
Apply to Working Men's Club, Hoyland Common, near Barnsley.

NEW Gasholder, 40 ft. diameter by 12 ft. deep, with Steel Standards; also new STEEL TANK to contain same.
Write J. Wright, 181, Queen Victoria Street, London, E.C.

FOR Sale, equal to new, a 12-in. Cowan's STATION GOVERNOR; also one 10-in. Gas Meter Company's, in first-class condition.
Apply for particulars to Robert Dempster & Sons, Ltd., Elland.

GAS PLANT for Sale—I can always offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. Compare Prices and Particulars before ordering elsewhere.
J. F. Blakeley, Gas Engineer, Thornhill, Dewsbury.

TO BE SOLD CHEAP—Taylor-made Solid Lead SATURATOR of 3 to 4 Tons of Salt per Twenty-four hours Capacity. Body 1¼ inches, bottom 1¼ inches thick lead, with heavy Timber Frame and Cradle. Has well for Sulphate Lifter. Equal to new; replaced by larger size.
For Price and to Inspect, address, in first instance, to No. 4314, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

BOROUGH OF ROCHDALE.

TO FIRE-BRICK MAKERS AND OTHERS.

THE Gas Committee of the above Cor- poration invite TENDERS for the supply of such quantities of FIRE-BRICKS, BLOCKS, TILES, &c., as they may require during a period of Twelve Months ending the 31st of December, 1905.
Forms of Tender may be obtained on application to Mr. T. Banbury Ball, the Manager, at the Gas-Works.
Tenders, endorsed "Fire-Clay Goods," must be sent in to me not later than noon on Wednesday, Jan. 11, 1905.

By order,
Wm. Henry Hickson,
Town Clerk.
Town Hall, Rochdale.
Dec. 30, 1904.

BOROUGH OF ROCHDALE.

TO MAKERS OF WOOD GRIDS.

THE Gas Committee of the above Cor- poration invite TENDERS for the supply of about 8000 feet of 2-inch WOOD PURIFIER GRIDS, in 600 Plain and 320 Special Grids each 4 ft. 3 in. by 1 ft. 11⅝ in., the latter to be made to fit standards, &c.
Copies of the Specification and any further Particulars may be obtained on application to Mr. T. Banbury Ball, the Manager, at the Gas-Works.
Tenders, endorsed "Grids," must be sent in to me not later than noon on Wednesday, Jan. 11, 1905.

By order,
Wm. Henry Hickson,
Town Clerk.
Town Hall, Rochdale,
Dec. 30, 1904.

CITY OF RIPON.

THE Corporation invite Tenders for RE-TUBING Four ANNULAR CONDENSERS.
Plans and Specifications prepared by the Gas Manager; and any further Information may be obtained on application to him at the Gas-Works, Ripon, on remitting cheque or Postal Order for 10s. 6d., which will be returned on receipt of a *bonâ-fide* Tender.
Tenders to be sent in to me sealed and marked on the outside "Gas-Works Tender," on or before Wednesday, the 18th day of January next.
The acceptance of the lowest or of any Tender is not guaranteed.

By order,
M. Kirkley,
Town Clerk.
Town Hall, Ripon.
Dec. 15, 1904.

TENDERS FOR GAS COAL.

THE Lighting Department of Copen- hagen is prepared to receive TENDERS for the supply and delivery of 150,000 Tons of best GAS COAL from the beginning of March until the end of December, 1905.
The Lighting Department reserves the right to divide the Contracts between two or more Contractors.
Further Information and Conditions for the delivery may be obtained on application to Direktoren for Kjobenhavns Belysningsvæsen, Vester Boulevard 22, Copenhagen B.
The Tenders, sealed and marked "Tilbud paa Kul," to be sent to Direktoren for Kjobenhavns Belysningsvæsen, Vester Boulevard 22, Copenhagen B, before the 16th of January, 1905, Twelve o'clock, at which time the Tenders will be opened in the presence of the Parties tendering who are in attendance.
The Lighting Department of Copenhagen.
Dec. 17, 1904.

TO GASHOLDER MAKERS.

THE Gas Committee of the Coventry Corporation invite TENDERS for the Construction, Delivery, and Erection of a TELESCOPIC GAS-HOLDER of Two Lifts, about 60 feet diameter, the Lifts being each 20 feet deep, at their Foleshill Works.
Specification, Form of Tender, and Schedule of Quantities, together with prints of the drawings, may be obtained on application to the undersigned, and on payment of One Guinea (which will not be returned).
The Committee do not bind themselves to accept the lowest or any Tender.
Tenders must be delivered not later than first post Monday, the 16th day of January next, addressed to the Chairman of the Gas Committee, Gas-Works, Coventry, and endorsed "Tender for 60 feet Gasholder."
Fletcher W. Stevenson,
Engineer and General Manager.
Gas-Works, Coventry.
Dec. 23, 1904.

NEW CONVEYOR COMPANY, LIMITED, SMETHWICK, BIRMINGHAM.

THE attention of the Directors of the New Conveyor Company, Limited, has been called to certain letters and circulars recently issued by Mr. Gilbert Little, late Chairman and Managing-Director of the Company, but now holding no official position in the Company.
Mr. Gilbert Little has made a wholly unauthorized use of the letter paper and the name of the Company, and the Company has been compelled to take proceedings in the Chancery Division against Mr. Little and to obtain the perpetual Injunction against him set out below. To prevent misunderstanding, the Board desire me to point out the following facts.

1.—The New Conveyor Company, Limited, has no connection whatever with any other Company formed or to be formed by Mr. Gilbert Little.
2.—Mr. Gilbert Little and his sons are not now either officially connected with, or in the employ of, the New Conveyor Company, Limited.
3.—The New Conveyor Company, Limited, has not parted with any of its patent rights and the patents under which so many Conveyors and Elevators have been erected by the Company remain, by arrangement, vested in the Company, and Conveyors and Elevators in accordance with these patents can only be supplied by the Company.

1904. N. No. 1752.

In the High Court of Justice,
Chancery Division,
Mr. Justice Kekewich.
Mr. R. H. W. Leach,
Regr.
Friday, the 16th day of December, 1904.

Between
The New Conveyor Company, Ltd., Plaintiffs,
and
Gilbert Little, Defendant.

Upon Motion for an injunction this day made unto this Court by Counsel for the Defendant and the Plaintiffs by their Counsel consenting to treat the hearing of the said Motion as the trial of this Action and consenting to this Judgment THIS COURT DOTH ORDER AND ADJUDGE that the Defendant Gilbert Little be perpetually restrained from using the note-paper of the Plaintiffs or any colourable imitation thereof or any note-paper or envelopes marked with the Plaintiffs' name and from issuing any circular or writing in the name of the Plaintiffs and from representing the DEFENDANT as being Chairman and Managing-Director or otherwise employed by or as holding any office in the Plaintiff Company and from using the name of the Plaintiffs so or in such manner as to represent or suggest that the Defendant is carrying on or assisting in carrying on or interested (otherwise than a Shareholder) in the Plaintiff Company And the Plaintiffs waiving any enquiry as to damages THIS COURT DOTH ORDER that the Defendant Gilbert Little do pay to the Plaintiffs their costs of and incidental to this Action as between them and their Solicitors and including therein any costs incurred prior to the Writ of Summons (such costs to be taxed by the Taxing Master).

NEW CONVEYOR CO., LTD.,
W. T. Holland,
Secretary.
Smethwick, December 27, 1904

TO RETORT AND FIRE-BRICK MANUFACTURERS.

THE Corporation of Birkenhead are prepared to receive TENDERS for RETORTS, FIRE-BRICKS, and FIRE-CLAY required at the Gas-Works during the ensuing Twelve Months.

Forms of Tender may be obtained from Mr. T. O. Paterson, Gas Engineer, Gas-Works, Thomas Street.

Tenders, Sealed and endorsed "Tender for Retorts, &c.," to be sent in to me not later than Five p.m. on Thursday the 12th of January, 1905.

The person whose Tender may be accepted will be required to enter into a Contract containing a clause as to the payment of the rate of wages, and the observance of the hours of labour recognized and agreed upon between the Trades' Unions and the Employers in the locality in which the work for carrying out the Contract is to be performed.

The Corporation do not bind themselves to accept the lowest or any Tender.

By order,
ALFRED GILL,
Town Clerk.

Town Hall, Birkenhead,
Dec. 31, 1904.

ISSUES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MR. ALFRED RICHARDS begs to notify that his ISSUES by AUCTION under PARLIAMENTARY POWERS of STOCKS and SHARES in LONDON, SUBURBAN, and PROVINCIAL GAS and WATER COMPANIES take place PERIODICALLY at the Mart, TOKENHOUSE YARD, E.C.

Terms for Issuing such Capital, and also for including Gas and Water Stocks and Shares belonging to Private Owners in these Periodical Sales, can be obtained on application at MR. ALFRED RICHARDS' OFFICES, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
GUILDFORD GAS LIGHT AND COKE COMPANY.

NEW ISSUE OF £5000 ORDINARY STOCK.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, Jan. 17, 1905, at Two o'clock, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
LOWESTOFT WATER AND GAS COMPANY.

NEW ISSUE OF 400 ADDITIONAL ORDINARY £10 SHARES,
Ranking for a Maximum Dividend of 7 per cent.; previous issues of similar Shares now receiving 5½ per cent.; also
£1000 FOUR PER CENT. PERPETUAL DEBENTURE STOCK.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, Jan. 17, 1905, at Two o'clock, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
MAIDENHEAD GAS COMPANY.

NEW ISSUE OF £5000 CONSOLIDATED ORDINARY STOCK.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, Jan. 17, at Two o'clock, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
SOUTHGATE AND DISTRICT GAS COMPANY.
(Formerly called the Colney Hatch Gas Company.)

NEW ISSUE OF £4000 ADDITIONAL ORDINARY STOCK.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, Jan. 17, 1905, at Two o'clock, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

NEWCASTLE AND GATESHEAD WATER COMPANY.

SALE BY AUCTION OF £54,000 (OR THEREABOUTS)
OF SEVEN PER CENT. MAXIMUM
ORDINARY STOCK (ACT 1898).

MR. CHARLES A. JOEL will Sell by AUCTION, at the Company's Offices, Pilgrim Street, Newcastle-on-Tyne, on Tuesday, the 17th of January, 1905, at Half-past Twelve o'clock in the Afternoon, £54,000 (or thereabouts) of 7 PER CENT. MAXIMUM ORDINARY STOCK, under the Act of 1898, in Lots of £100.

The above Stock is the balance of the 7 per cent. Maximum Ordinary Stock created under the powers of the Newcastle and Gateshead Water-Works Act, 1898.

The dividend is subject to proportionate diminution whenever the maximum dividend to which each class of Ordinary Stock of the Company is entitled shall not be paid in full; but such diminution may be made up in subsequent years.

Printed Particulars and Conditions of Sale may be had at the Company's Offices, and Messrs. George Armstrong and Sons, Solicitors, Newcastle-on-Tyne; or of the Auctioneer, 27, Northumberland Street, Newcastle-on-Tyne.

GEORGE SMITH,
Secretary and General Manager.

Newcastle-on-Tyne, Dec. 7, 1904.

REDHILL GAS COMPANY.

SALE OF ORDINARY "B" STOCK.

NOTICE is Hereby Given, that it is the intention of the said Company to SELL BY TENDER, £5000 OF ORDINARY "B" STOCK of, and in the, Redhill Gas Company.

The last day for the reception of Tenders will be Thursday, the 19th day of January, 1905, at Twelve o'clock, at Noon.

Forms of Tender, with Particulars of Sale and Conditions of Tender attached, can be had upon application at the Company's Office, Brighton Road, Redhill.

By order,
C. READ,
Secretary.

Redhill, Surrey,
Dec. 17, 1904.

READING GAS COMPANY.

(INCORPORATED BY 25TH AND 26TH VIC. CAP. 84, 30TH JUNE, 1862).

SALE BY TENDER OF £20,000 ORDINARY STOCK.

THE Directors invite Tenders (at not less than £105 per £100 Stock) for £20,000 Ordinary Stock in the above-named Company, to be raised in pursuance of the powers of "The Reading Gas Act, 1902."

This Stock will rank for a maximum dividend of 5 per cent. per annum. Full dividends on the Company's Stocks and Shares have been paid since its Incorporation in 1862.

The Stock will be issued in amounts of not less than £10, or multiples thereof, and will be registered in the names of the purchasers (or their nominees) free of expense.

Payment for the Stock is to be made as follows:—One half of the allotment and the whole of the premium on or before the 31st of January, 1905, and the balance of the allotment on or before the 31st of March, 1905, from which respective dates the dividend will commence to accrue.

The Dividends are paid half-yearly on or about the 1st of March and the 1st of September.

The liability of the Stockholders is limited—that is, when the Stock is paid for there is no further liability.

Particulars, with Forms of Tender, may be obtained on application to the Secretary, to whom Tenders must be delivered not later than Monday, the 16th of January next.

By order of the Directors,
A. CANNING WILLIAMS,
Secretary.

7, King Street, Reading,
Dec. 20, 1904.

Now Ready. Price 5s. 6d. Post Free.

REPORTS OF DISTRICT GAS ASSOCIATIONS FOR 1903.

LONDON:
WALTER KING, 11, Bolt Court, FLEET STREET, E.C.

SOMETHING NEW.

Mr. Micawber expected something good to turn up.

IT HAS.

"CYCLONE"

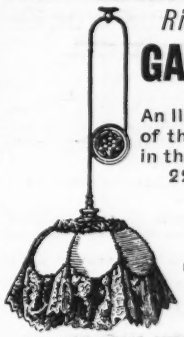
WRITE FOR PARTICULARS—
THE
IMPERIAL STOVE COMPANY,
LEAMINGTON.

NEWBATTLE CANNEL.

Highest Results in Gas, & Excellent Coke.

QUOTATIONS ON APPLICATION TO
THE LOTHIAN COAL COMPANY,
LIMITED,
NEWBATTLE COLLIERIES,
DALKEITH, N.B.

THE "HANWELL" PATENT *Rising and Falling* GAS PENDANT.



An Illustrated Description of this Pendant appeared in the "Journal" for Nov. 22, 1904 (page 599).

Write for full Particulars to the
"HANWELL" Pendant Company,
96, ABINGTON STREET, NORTHAMPTON.

THE
"ROTARY" STATION METER.

Efficiency Demonstrated.

APPLY—
T. G. MARSH,
MAWSON CHAMBERS, DEANSGATE,
MANCHESTER.

JAMES OAKES & CO.,

ALFRETON IRON-WORKS, DERBYSHIRE,
AND
Wenlock Iron Wharf, 21 & 22, Wharf Road, CITY ROAD, LONDON, N.,

Manufacture and keep in Stock at their Works (also large stock in London)

PIPES and CONNECTIONS, 1½ to 48 inches in diameter, and make and erect to order RETORTS, PURIFIERS, and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.

NOTE.—Makers of HORSLEY'S PATENT SYPHONS. These are cast in one piece, without Chaplets; doing away with Bolts, Nuts, and Covers, and rendering Leakage impossible.

'BUFFALO' INJECTOR

RAILS.

New and Second-Hand with all Accessories; also Tip Waggons and Turntables.

B. M. RENTON,
MIDLAND WORKS,
SHEFFIELD.

TROTTER, HAINES, & CORBETT, LIMITED,
BRETTELL'S ESTATE
FIRE-CLAY & BRICK WORKS,
STOURBRIDGE.

Manufacturers of GAS-RETORTS, GLASSHOUSE FURNACE & BLAST-FURNACE BRICKS, LUMPS, TILES, and every description of FIRE-BRICKS.
Special Lumps, Tiles, and Bricks for Regenerative and Furnace Work.
SHIPMENTS PROMPTLY AND CAREFULLY EXECUTED.

LONDON OFFICE: R. CULL, 31, OLD BROAD STREET, E.C.

Gas Companies are solicited to try Samples of the
MIRFIELD GAS COAL
UNEQUALLED.
Sperm Value 878·85 lbs. per Ton.

Prices and Analysis on application.

The MIRFIELD (GAS-COAL) COLLIERIES CO.,
RAVENSTHORPE, NEAR DEWSBURY.

HEATHCOTE GAS COAL.
Rich in Illuminating Power and yield of Gas Above the Average in Weight and Quality of Coke.
Maintains a High Standard in Residuals.

THE GRASSMOOR CO., LD.,
CHESTERFIELD.

THE PERFECT MANTLE COY.,
28, Minories, London, E.C.
Manufacturers of Incandescent Mantles.
Importers of all kinds of Fittings & Accessories.

TRY OUR WELL-KNOWN
SUPERIOR "PERMCO" MANTLES.

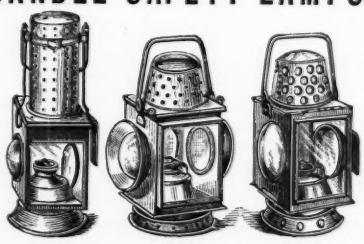
Illustrated Catalogue Free on Application.
Agents for the "WOLFF LIGHT" INVERTED LAMP.

THOMAS TURTON AND SONS, LIMITED,
SHEAF WORKS, SHEFFIELD,
MANUFACTURERS OF
FILES OF BEST QUALITY
FOR ENGINEERS.
STEEL OF ALL DESCRIPTIONS.
SCREW STOCKS, TAPS AND DIES, SPANNERS, RATCHET BRACES, LIFTING JACKS, ANVILS, VICES, AND ENGINEERS' TOOLS GENERALLY.
LONDON OFFICE:
90, CANNON STREET, E.C.

THOMAS DUXBURY & CO.,
16, DEANSGATE, MANCHESTER.
Best Gas Coal and Cannel, giving High Illuminating Power, Large Yield per ton, and reasonable in Price.
Telegrams: "DARWINIAN, MANCHESTER."
Telephone 1806.

JOHN HALL & CO.,
STOURBRIDGE,
Manufacturers of
FIRE-BRICKS, LUMPS, TILES,
GAS RETORTS,
And every description of Fire-Clay Goods.
RETORTS CAREFULLY PACKED FOR SHIPMENT.

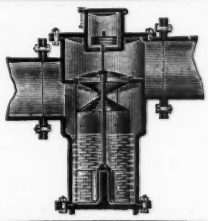
ARMSTRONG'S PATENT
CANDLE SAFETY LAMPS.



No. 1. No. 2. No. 3.

49, MANCHESTER STREET, GRAY'S INN ROAD, W.C.

JAMES MILNE & SON, LTD.,
GAS ENGINEERS
MILTON HOUSE WORKS EDINBURGH.
LONDON. —— LEEDS. —— GLASGOW.



THE WIGAN COAL & IRON CO., LIMTD.,
Are exclusive Owners of the well-known HAIGH HALL & KIRKLESS HALL GAS COAL COLLIERIES, and supply the Best Wigan Arley Mine Gas Coal, Gas Nuts, Gas Cannel, Cannel Nuts, &c.
MIDLAND AND WEST OF ENGLAND DISTRICT OFFICE: *6, CORPORATION STREET, BIRMINGHAM—Sole Agent: A. C. SCRIVENER.*
Telegraphic Address "WIGAN, BIRMINGHAM." Telephone No. 200.
LONDON DISTRICT OFFICE: *6, STRAND, LONDON—C. PARKER & SON, Sole Agents.*
Telegraphic Address: "Parker London."

GAS ENGINEERS.
CONTRACTORS FOR, AND ERECTORS OF, ALL GAS-WORKS PLANT.

REGENERATORS, GENERATORS, AND DIRECT-FIRED RETORTS.
RESULTS GUARANTEED.

COMPLETE INSTALLATIONS OF HORIZONTAL AND INCLINED RETORTS.

ADDRESS—
NEWTON CHAMBERS, CANNON ST., **BIRMINGHAM.**

Incandescent Mantle Protector.

Protected.

25%

MORE LIGHT, LESS GAS.

NO BURNER COMPLETE WITHOUT.
WILL FIT ANY BURNER.
USED BY THE MILLIONS.

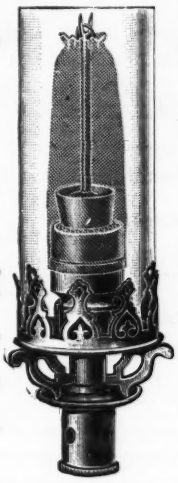
Sample gross 6s., sample half gross 3s. 3d., cash with order. Reductions for Quantities.

Show Cards supplied.

Ask your Wholesaler for a supply, or write to the

Midland Incandescent Mantle Co.,
WOLVERHAMPTON.
London Office: 65, NEWINGTON CAUSEWAY, S.E.

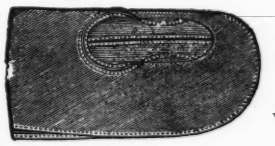
Sole Agent for London:
M. SINGER, 127, WATERLOO ROAD, S.E.



CASES FOR BINDING
QUARTERLY
VOLUMES OF THE "JOURNAL"
PRICE 2s. EACH.

THOMAS BUGDEN, MANUFACTURER OF

TAR and LIQUOR HOSE, and Special AIR TUBING.



BELLOWS made to inflate a 42-inch Bag under One Minute. Various sizes made.

STOKERS' MITTS.
Made from best Tanned Leather.

India-rubber Goods of every description, Leather Bands, Oils, &c., Diving and Wading Dresses, Waterproof Coats and Capes, Sewer Boots, and Theatrical Air-Proof Dresses.

Fire-Engine Hose and Appliances.

Best Materials and Workmanship Guaranteed.

Gas-Bags for Mains. All Seams Stitched and Taped.

Miners' Woollen Jackets (Also made in Blue Serge.) **No. 1, 12/- each; No. 2, 9/6.**

116-118, GOSWELL ROAD, E.C.

THE LEEDS FIRECLAY CO., LTD.

CLIFF'S BRANCH.

LONDON OFFICES & DEPÔTS:
Baltic Wharf, Waterloo Bridge, S.E. and G.N. Goods Station, King's Cross, N.

Liverpool: Leeds Street.
Leeds: Queen Street.

CLIFF'S PATENT Machine-Made Retorts

Cliff's Patent Machine-Made Retorts possess the excellent quality of remaining as near stationary as possible under the varying conditions of their work—a quality which will be appreciated by all Gas Engineers and Managers. The generally expressed opinion is that these Retorts are the very best that are made.

Retorts carefully Packed for Export.

Fire-Bricks, Lumps, Tiles, &c., &c., of every description suitable for Gas-Works.

Now Ready, pp. 584 & XVI. 251 Illustrations. F'Cap. Quarto, Price 18s. net (Post Free).

THE SEVENTH EDITION OF

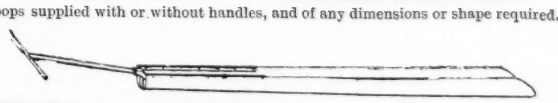
NEWBIGGING'S HANDBOOK
FOR GAS ENGINEERS AND MANAGERS
(DEDICATED TO SIR GEORGE LIVESEY).

The Work has been revised throughout, and contains 40 pages of Letterpress and 12 Illustrations more than the last Edition.

In almost every department additions have been made; and it is believed that the labour bestowed on its production will enhance the value of the book as a Work of Reference.

Orders may be sent through any Bookseller, or direct to the Publisher,
WALTER KING, 11, BOLT COURT, FLEET STREET, E.C.

STEEL SCOOPS
FOR
RETORT CHARGING.
Scoops supplied with or without handles, and of any dimensions or shape required.



HENRY SYKES, Ltd., Engineers,
66, BANKSIDE, LONDON, S.E. Telephone No. 565 HOP.

SCOTT SNELL
GAS LAMPS OUTSHINE ALL OTHER LAMPS

WHY THE SCOTT SNELL LAMP IS
The Most Efficient AND The Most Economical } **GAS LAMP IN THE MARKET.**

BECAUSE a light of **600 CANDLES** can be obtained from a **SINGLE BURNER** with **15 CUBIC FEET OF GAS** per hour.

ABSOLUTELY THE HIGHEST EFFICIENCY IN GAS LIGHTING.

The BEST LAMP for:

PUBLIC STREET LIGHTING.
RAILWAY STATIONS. PLATFORMS.
DOCKS. WAREHOUSES. LARGE INTERIORS.
LANDING STAGES. PIERS. JETTIES. SEA FRONTS.
GAS-WORKS. RETORT-HOUSES, &c., &c.

No High-Pressure Mains.
No Disturbance of Service.

Special terms to Gas Companies and Municipal and District Councils.

Illustrated Catalogue and Full Particulars on application to

THE SCOTT SNELL SELF-INTENSIFYING GAS LAMP CO., LTD.,
MUNT'S BUILDINGS, 11, ST. JOHN'S HILL, CLAPHAM JUNCTION, LONDON, S.W.

F. C. SUGDEN & Co.

CARBONIZING SPECIALISTS.

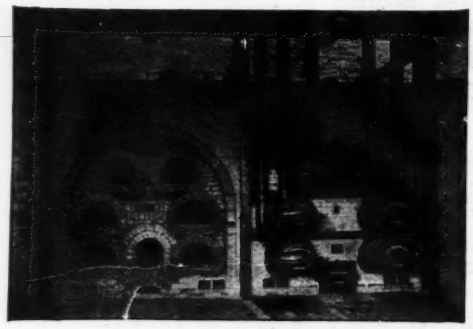


PHOTO. OF REGENERATOR SETTINGS DURING CONSTRUCTION.

REGENERATOR & GENERATOR SETTINGS

DEEP, SEMI-DEEP, AND SHALLOW.

Maximum Make per Ton and Mouthpiece.

Minimum Fuel Consumption.

NUMEROUS REPEAT ORDERS

Have been received for each of the above types of Settings.

RESULTS GUARANTEED. RETORTS RESET.

SOLE MAKERS OF **CRIPPS' PATENT CHIMNEY.**

Designs and Estimates on application. **28, EAST PARADE, LEEDS.**

Every Description of

FIRE-CLAY GOODS

OF BEST QUALITY ONLY.

Personal attention given to all orders.

MOBBERLEY & PERRY, STOURBRIDGE.

INCLINED AND HORIZONTAL RETORTS of both Taper and Parallel Sections.

SPECIALS FOR WATER GAS PLANTS.

CHECKER BRICKS ALWAYS IN STOCK.

LARGE STOCKS KEPT.

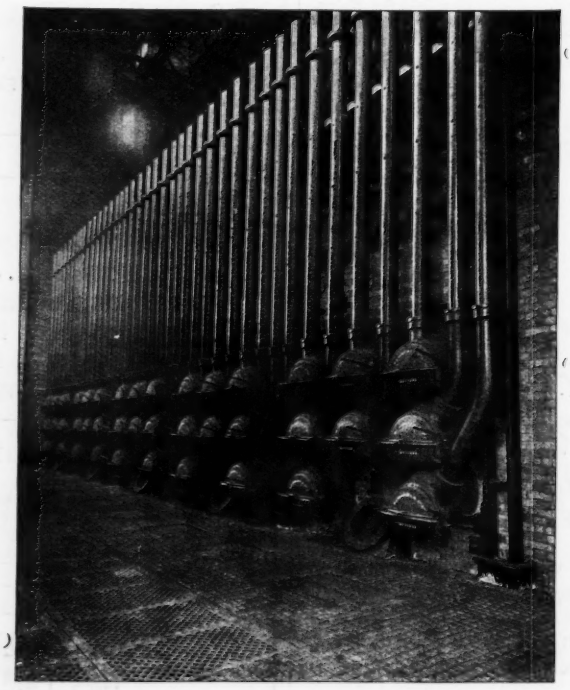
INCLINED RETORTS.

WE

make every single part of the Installation in our own Works at

RETFORD,

Including the Roofs, Coal Tippers, Coal Breakers, Coal Elevators, Coal Conveyors, Hot Coke Conveyors and Screening Plants, Retort Mouthpieces with Self-Sealing Lids, Stage Floors, Foul and Hydraulic Mains, Ascension, Arch, and Dip Pipes, &c., &c.



WE

only buy the Bricks and Raw Material. So under these conditions we have gained a

REPUTATION

for nothing but the Highest Class of Work, as can be seen in our Illustrations at Smethwick, Leek, Liverpool, Malvern, Shipley, &c., &c.

W. J. JENKINS & CO., Ltd., RETFORD.

STEPHENS & CO., KIDWELLY.

Contractors to a large number of the Principal Gas-Works.

SPECIAL IMPROVED

SILICA BRICKS, BLOCKS, SHIELDS, TILES.

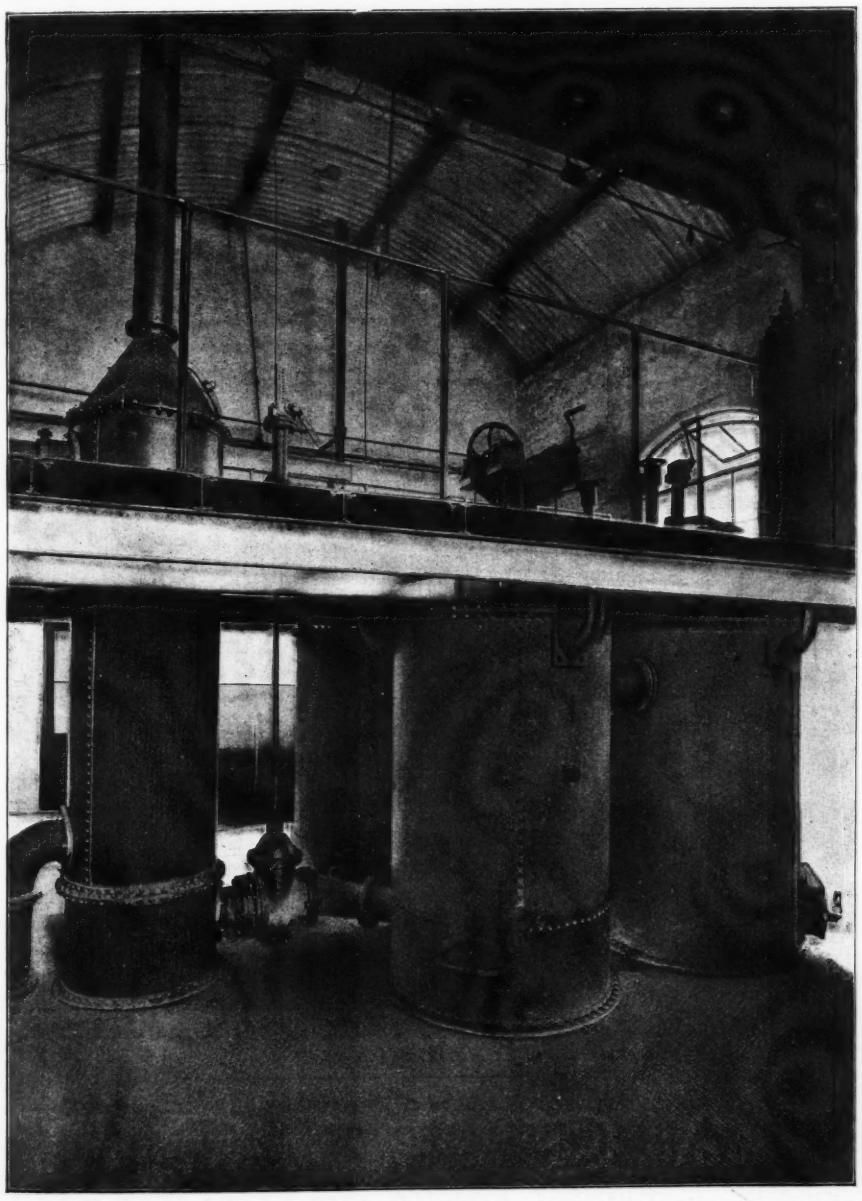
SPECIAL PLASTIC SILICA CEMENT.

Without doubt the finest Materials in the Market for Gas-Works Furnaces.

BRICKS, BLOCKS, TILES, & SHIELDS of any shape made to order.

BLUE WATER-GAS APPARATUS

(DR. KRAMERS & AARTS PATENTS).



The Kramers and Aarts Blue Water Gas Plant at the Zevenbergen Gas-Works.

Guaranteed Results per 1000 Cubic Feet of Gas.

Calorific Power, 315 B.T. U per cubic foot.

Use of Carbon in the Generators, 22 lbs.

Use of Steam in the Generators, 3·3 Gallons.

Percentage Composition:

CO_2	3·5
O_2	0·2
CO	45·0
H	48·0
Difference	3·3

Plants erected since 1902, or in erection, at the following Gas-Works—

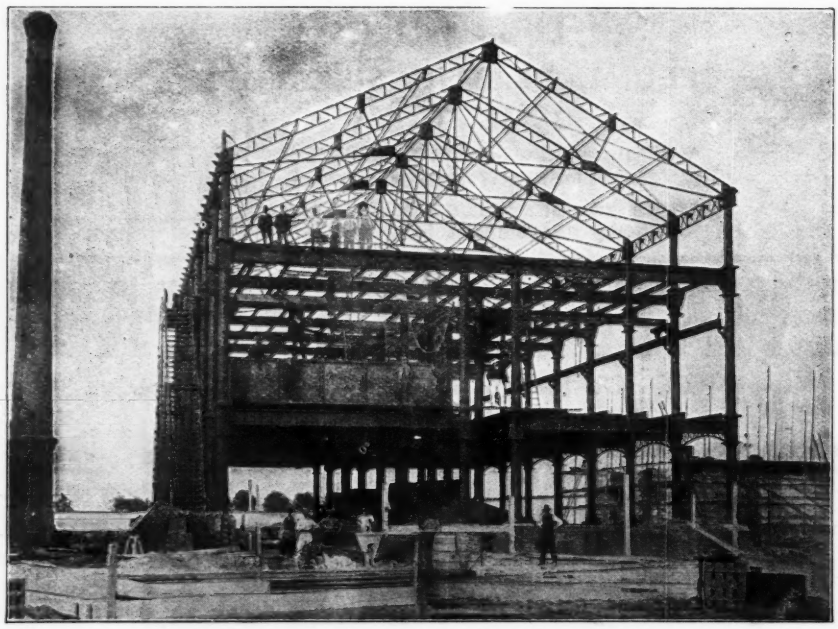
	Cubic Feet Daily.
Amsterdam - -	2,118,000
Zevenbergen - -	125,000
Breda (Test Station)	425,000
Cadiz - - -	125,000
Venlo - - -	175,000

Offices: P.C. HOOFTSTRAAT 62, AMSTERDAM.

THE WHESSOE FOUNDRY CO., LTD.

Works: DARLINGTON.

MAKERS OF EVERY DESCRIPTION OF GAS PLANT.



GASHOLDERS AND DRY-SEAL PURIFIERS A SPECIALITY

PHOTO. OF STAGE-FLOOR PURIFIER-HOUSE TAKEN DURING ERECTION FOR THE UNION DES GAZ AT THEIR WORKS NANTERRE, PARIS.

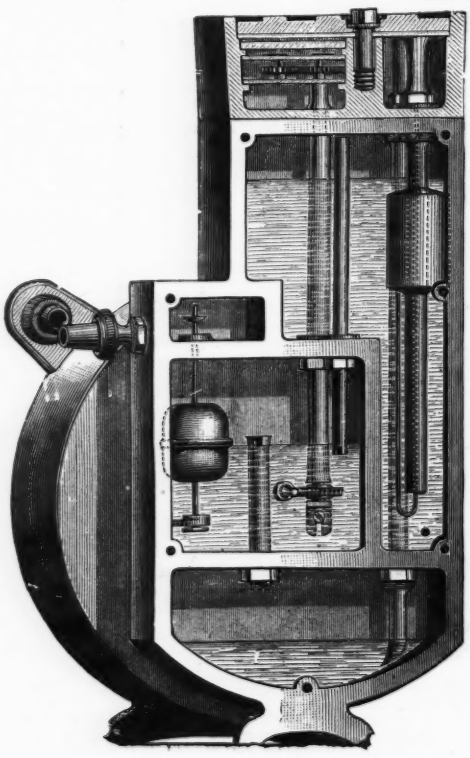
London Office: 106, CANNON STREET, E.C.

ALDER AND MACKAY.

MANUFACTURERS OF

IMPROVED WET AND DRY GAS-METERS

IN CAST-IRON AND TIN CASES OF THE HIGHEST EXCELLENCE.



Sole Makers of Green's Patent Underground Wet Gas-Meters for Street Lighting, &c., and Ogden's Patent Spindle Tube for Wet Gas-Meters.

GREEN'S PATENT UNDERGROUND METER

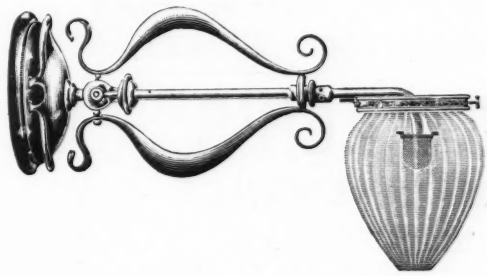
Has been designed to obviate that which has hitherto prevented the general adoption of underground Meters—namely, their serious cost No box is required; and the saving thus effected as compared with ordinary underground Meters, where either a box or meter-pillar is necessary, is fully one-half. The price of one for three lights is 28s.; and the other sizes are correspondingly cheap. When fixed, the only part of the Meter exposed to view measures 6½ inches by 3½ inches. By the Indicator with which the Meter is fitted, the Inspector can at once discern whether water is required; but as the Meter is of the compensating description, water will probably need only be supplied ONCE A YEAR. It is advisable to fill the Meter with a non-freezing liquid which does not injure the fittings; and this can be supplied at about 1s. 8d. per gallon.

Prices and all Information on Application.

NEW GRANGE WORKS, EDINBURGH.

HIGHEST AWARDS given for our WET and DRY METERS at

Exhibitions held at GLASGOW, CALCUTTA, and EDINBURGH.



A Scientific Triumph

Is the "K" Inverted Incandescent Burner. It shows what a combination of brains and British Workmanship can do. It is simple and cannot give any trouble; it gives more light than any other; it consumes less gas in proportion; it knows no soot or smell; and yet it can be sold at the revolutionary price of 3s., including Mantle. It sounds exaggerated, but it is sober fact. Every Gas Engineer is interested in testing our claims and pushing the Burner, which is without a doubt one of the finest popularizers of Incandescent Gas. Moffats Ltd., 155, Farringdon Road, London, E.C.

GENERAL HEATING & LIGHTING CO., LTD.,
(MOELLER'S SYSTEM),
26. VICTORIA STREET, LONDON, S.W.

MOELLER'S BURNERS
MAINTENANCE SIMPLIFIED.
Nothing to Corrode. Nothing to Choke.
Nothing to get out of Order.
Made in 4 Sizes consuming 3, 4, 4½, and 6½ feet. In Brass or Nickelled.
PRICE LIST ON APPLICATION.

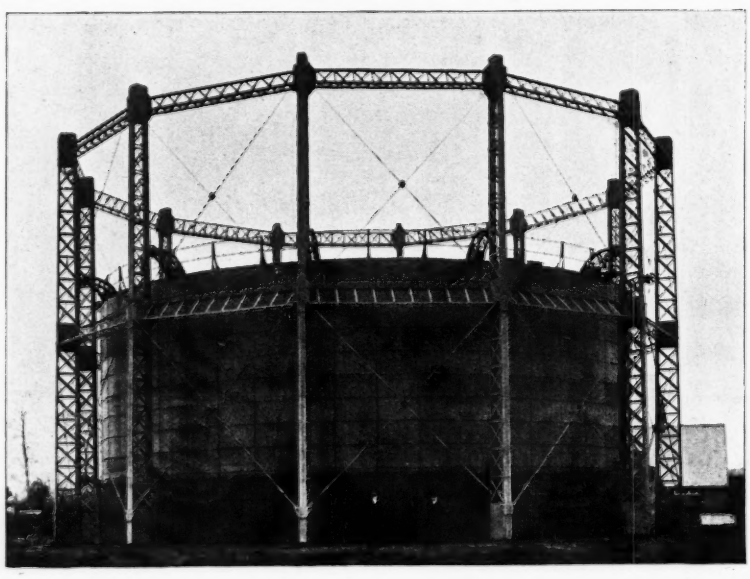
COAL TAR PRODUCTS.

Benzol, Toluol, Solvent Naphtha, Creosote Oils, Grease Oils, Carbolic Acid, Crude Creosote Salts, Granulated (Crude) Naphthalene, Sublimed Naphthalene, Anthracene, Refined Tar, Pitch, also Sulphate of Ammonia.

For Prices apply to the SOUTH METROPOLITAN GAS COMPANY,
Works: ORDNANCE WHARF, EAST GREENWICH, LONDON, S.E.
709, OLD KENT ROAD, LONDON, S.E.
Telegraphic Address: "METROGAS, LONDON."

THE HORSELEY CO., LTD., TIPTON, STAFFORDSHIRE.
MAKERS OF GASHOLDERS & GAS PLANT.
PURIFIERS, SCRUBBERS, CONDENSERS, WASHERS, TANKS, VALVES, PIPES, LAMP-PILLARS, RETORT-FITTINGS, ETC.

ALSO ALL KINDS OF
STRUCTURAL IRON AND
STEEL WORK
BRIDGES,
ROOFS,
PIERS, ETC.



WORKS & HEAD OFFICE:
TIPTON,
STAFFORDSHIRE.

LONDON OFFICE:
11, VICTORIA STREET,
WESTMINSTER.

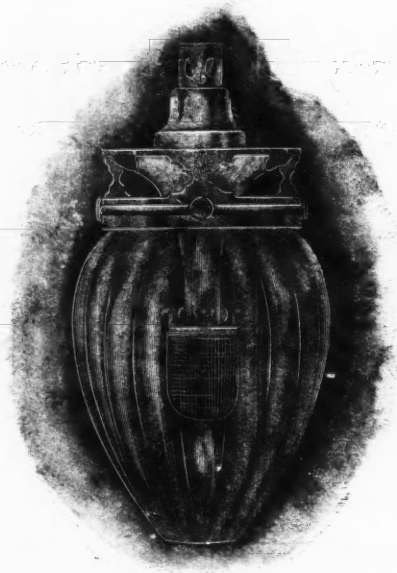
TELEGRAPHIC ADDRESSES:
"HORSELEY, TIPTON."
"GALILEO, LONDON."

THE ORIGINAL NEW INVERTED INCANDESCENT GAS-BURNERS

BRITISH MANUFACTURE.

INCREASED DISCOUNTS TO THE TRADE.

New types of BURNERS at popular Prices.

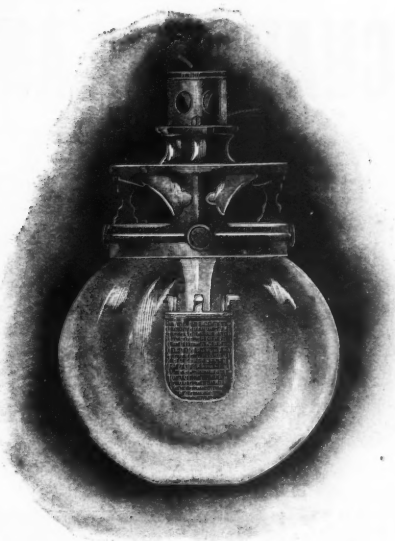


No. 2 Burner only, in Polished Brass or Steel Bronze, 4s. 6d.
Globes from 6d. each. Mantles 7s. per dozen.

MAXIMUM LIGHT WITH MINIMUM CONSUMPTION OF GAS.

The "Bijou" Burner in clusters for interior lighting has the decorative effect of Electric light at One-Eighth the cost.

NEW LISTS NOW READY.



No. 3 Bijou" Burner only, in Polished Brass or Steel Bronze, 3s.
Globes from 4d. each. Mantles 6s. 6d. per dozen

ONLY ADDRESS: **THE NEW INVERTED INCANDESCENT GAS LAMP CO., LD.,**
23, FARRINGDON AVENUE, E.C.

SAML. CUTLER & SONS,

MILLWALL, LONDON.

GASHOLDERS.
STEEL TANKS.
CONDENSERS.
ROOFS.

COLUMNLESS GASHOLDERS WITH CUTLER'S PATENT IMPROVED SPIRAL GUIDE ATTACHMENT.

JÄGER PATENT
PURIFIER GRIDS
CAPACITY OF PURIFIERS DOUBLED.
PRESSURE CONSIDERABLY REDUCED.

CARBURETTED WATER GAS
Maximum Efficiency Guaranteed.
A LARGE NUMBER OF PLANTS IN OPERATION.

Every Requirement for Gas-Works.

(188.)

ARROL-FOULIS

PATENT HYDRAULIC MACHINERY

FOR

CHARGING AND DRAWING GAS-RETORTS

SIR WILLIAM ARROL & CO., Ltd., Sole Makers,
DALMARNOCK IRON-WORKS, BRIDGETON,
GLASGOW.

LONDON ADDRESS: 32, VICTORIA STREET, WESTMINSTER, S.W.

PLANS AND ESTIMATES FURNISHED ON APPLICATION.

THE
ARROL-FOULIS
MACHINES
Are Employed at the following Works—

GLASGOW GAS-WORKS—
Tradeston.
Dawsholm.
Dalmarnock.

GASLIGHT & COKE COMPANY—
Beckton.
Shoreditch.
Bromley.

SOUTH METROPOLITAN GAS COMPANY—
East Greenwich
Vauxhall.
Rotherhithe.

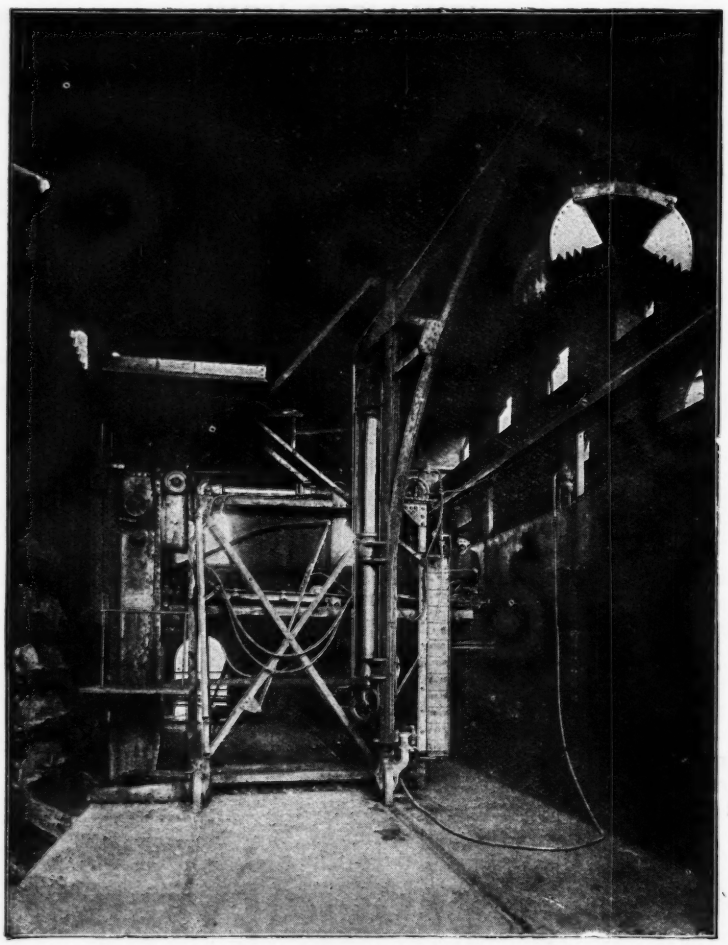
COMMERCIAL GAS-WORKS—
Wapping.
Poplar.

BROMLEY GAS-WORKS (KENT).

EDINBURGH GAS-WORKS.

LIVERPOOL GAS-WORKS.

BRIGHTON GAS-WORKS.



WAPPING GAS-WORKS.

THE
ARROL-FOULIS
MACHINES
Are Employed at the following Works—

LEEDS GAS-WORKS.

BIRMINGHAM GAS-WORKS.

BRITISH GAS CO.—
Hull.

BOLTON GAS-WORKS.

IMPERIAL CONTINENTAL GAS ASSOCIATION—
Amsterdam.
Vienna.
Berlin.

HAGUE CORPORATION GAS-WORKS—
Hague.

METROPOLITAN GAS-WORKS—
Melbourne.

CLEVELAND GAS-WORKS—
Cleveland, Ohio,
&c., &c., &c.

NEARLY
300 MACHINES
ARE AT
WORK OR IN COURSE OF CONSTRUCTION.

THE TIME TAKEN TO DRAW AND CHARGE EACH RETORT BY THESE MACHINES AVERAGES

UNDER ONE MINUTE.

BOWENS' Ltd. Successors,
STOURBRIDGE.

MANUFACTURERS OF
BEST FIRE-BRICKS; INCLINED, HORIZONTAL, and SECTIONAL RETORTS; LUMPS, TILES, &c., of every description.
ESTABLISHED 1860.

CLAYTON SON & Co LTD
LEEDS
MAKERS OF THE LARGEST GASHOLDER IN THE WORLD ALSO
THE ORIGINAL MAKERS OF
SPIRAL GUIDED GASHOLDERS
MAKERS OF ALL KINDS OF
STRUCTURAL IRON & STEEL WORK. STEEL FRAMED BUILDINGS
ROOFS RETORT FITTINGS
PURIFIERS RETORT LIDS
ANTIFREEZERS for Gasholders
STEEL TANKS
OF ALL SIZES
MAKERS OF THE LARGEST IN THE WORLD.
GASHOLDERS
OF EVERY DESCRIPTION & SIZE
HIGH CLASS BOILERS FITTED WITH CORRUGATED FLUES.
DEIGHTONS
Telegrams "GAS LEEDS." London Office 60 Queen Victoria St E.C.

MANNESMANN

LAMP POSTS

made throughout of
WELDLESS STEEL TUBING
including base, ring, and ladder rest.

Light, Strong, Unbreakable, and Cheap.

GAS, WATER, & STEAM TUBES AND FITTINGS.

WELDLESS STEEL
SPIGOT & FAUCET PIPES
for Gas and Water Mains.

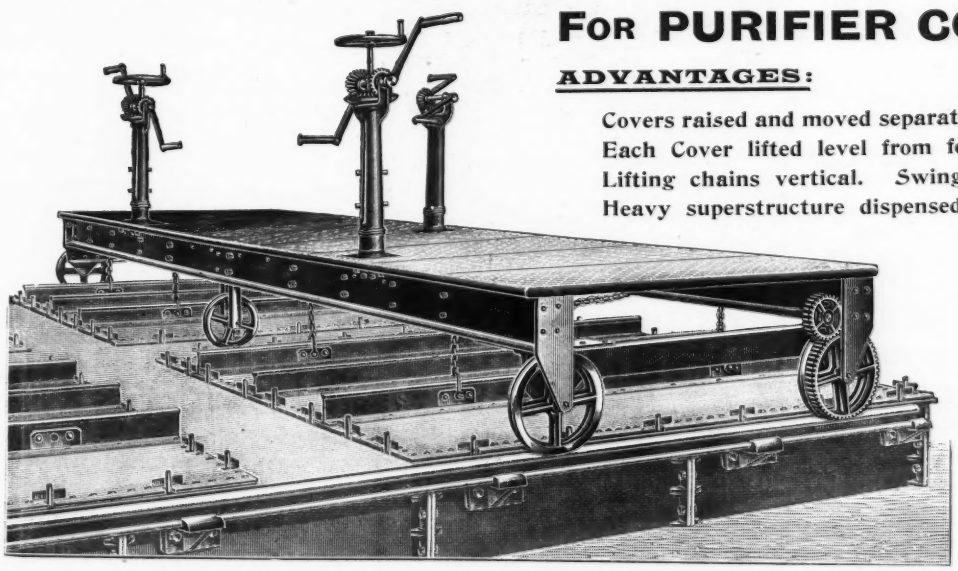
Tubes can be supplied up to 10 inches diameter and in lengths up to 40 feet.

THE BRITISH MANNESMANN TUBE COMPANY, LTD.,
110, CANNON ST., LONDON, E.C.
Birmingham Depôt: Bridge Works, LISTER ST.
Works: LANDORE, SOUTH WALES.

R. & J. DEMPSTER, Ltd.,

Telegraphic Address:
"SCRUBBER MANCHESTER."
MANCHESTER.

HOVEY'S PATENT LIFTING CRANE



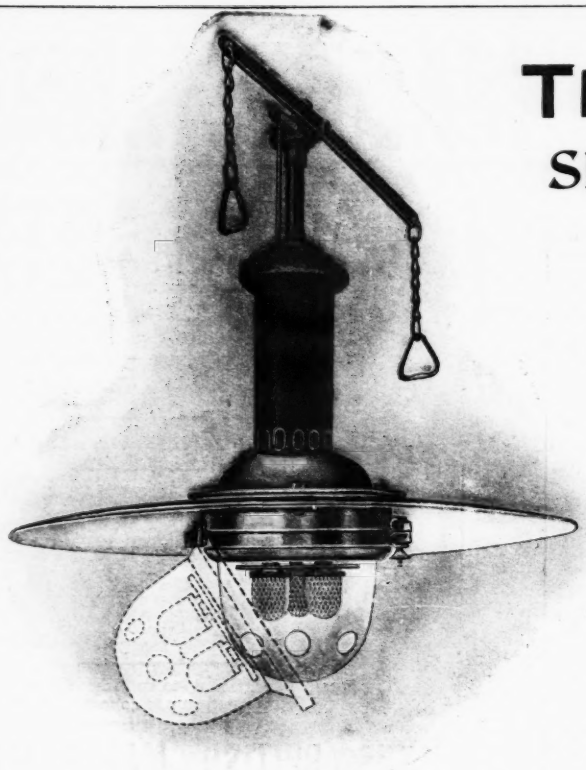
FOR PURIFIER COVERS.

ADVANTAGES:

Covers raised and moved separately or Two together.
Each Cover lifted level from four points.
Lifting chains vertical. Swinging avoided,
Heavy superstructure dispensed with.

Prices and Particulars on Application.

London Office: 165, GRESHAM HOUSE, OLD BROAD STREET, E.C.



The "DRURY"

Shadowless Inverted Cluster Lamp.

PATENTED AND REGISTERED.

A very efficient Lamp for all Buildings where a good downward light is wanted.

The special feature of the "**Drury**" Inverted Cluster Lamp is the way in which a cluster of Three Inverted Mantles is suspended from an interior white enamelled plate. The Three Mantles are arranged so close together that they have the appearance of one large brilliant Incandescent Ball, giving a surprising effect of its lighting power.

The Lamp is provided with a small interior Bye-Pass. Only "**Drury**" Mantles should be used to obtain the best effect, as they have a special Registered Holder which ensures the Mantles keeping a central position.

No. 2203. For Indoor use, 49s. 6d. Complete with Mantles, as shown. Extra Mantles, 7s. per dozen.

EVERED & CO., LIMITED,

27 to 35, Drury Lane, London, W.C., & 143 High Street, Shoreditch, E.

Works: SURREY WORKS, SMETHWICK, near BIRMINGHAM.

Telephone No. 8. Telegraphic Address: "ELEVATOR, HASLINGDEN."

S. S. STOTT & CO.,

ENGINEERS HASLINGDEN, NR. MANCHESTER.

COAL AND COKE ELEVATORS & CONVEYORS

COAL AND COKE STORAGE PLANTS.

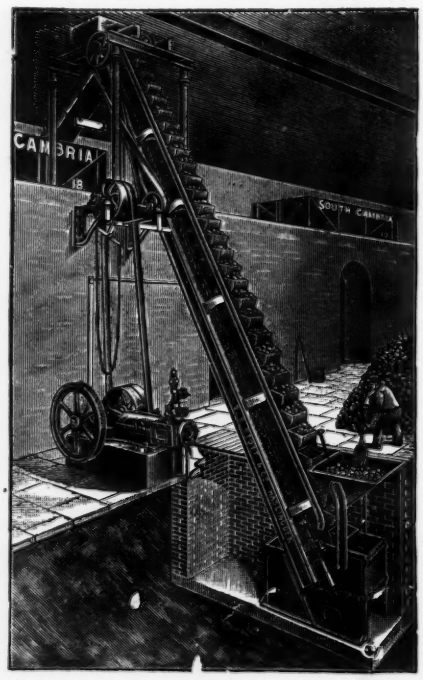
COAL AND COKE BREAKERS.

WHARF ELEVATORS FOR UNLOADING BARGES.

ELEVATORS & CONVEYORS for BOILER-HOUSES.

STAMPED AND RIVETED STEEL ELEVATOR BUCKETS.

DETACHABLE CHAINS AND SPROCKET WHEELS.



LIME AND OXIDE ELEVATORS & CONVEYORS.

HIGH-CLASS STEAM-ENGINES up to 1000-Horse Power.

PUMPS, HORIZONTAL AND VERTICAL, SINGLE, DOUBLE, or THREE-THROW, for WATER-WORKS, &c.

BEAM PUMPING-ENGINES.

AIR-COMPRESSORS.

BELT PULLEYS, ROPE PULLEYS, GEARING, &c., &c.

Coke Elevator Loading Railway Waggons.

Printed for WALTER KING by King, Sell, & Olding, Ltd.; and published by him at 11, BOLT COURT, FLEET STREET, in the CITY OF LONDON.—Tuesday, Jan. 3, 1905.